



# NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

## THESIS

**LINKING PPBES AND THE POM WITH CAPABILITIES**

by

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December 2006

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<b>REPORT DOCUMENTATION PAGE</b>			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
<b>1. AGENCY USE ONLY (Leave blank)</b>		<b>2. REPORT DATE</b> December 2006	<b>3. REPORT TYPE AND DATES COVERED</b> Master's Thesis	
<b>4. TITLE AND SUBTITLE</b> Linking the POM and PPBES with Capabilities			<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> John S. Boyce				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Naval Postgraduate School Monterey, CA 93943-5000			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> SPAWAR PEO C4I and Space, Director of Modernization OPNAV N-81			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b> The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited			<b>12b. DISTRIBUTION CODE</b> A	
<b>13. ABSTRACT (maximum 200 words)</b> <p>Recent Chairman of the Joint Chiefs of Staff Instructions (CJCSI) direct the development of new concepts to prioritize linking budgeting and programming for near- and mid-term resource allocation planning. For the Department of Defense (DoD), planning that falls within the Future Years Defense Plan (FYDP) or 0-7 years may be viewed as mid-term. This thesis raises the question of whether these new concepts will work best for the Department of the Navy (DON) or whether another methodology would better fit the Navy's near- and mid-term needs. Further, the thesis asks whether the implementation of the recently promulgated CJCSI instructions would be more disruptive to the DON instead of an alternative modification of what the DON is already using successfully.</p> <p>This thesis also explores the potential value of the newly formed capability planning initiative within the DON. The Navy initiative is compared to private-sector practices to define similarities and to develop additional potentially useful methods. The thesis also explores the potential usefulness of linear programming or mathematical decision modeling for the application of weights and values to relate input variables and relationships to desired outputs. Finally, procurement narrative statements in the FY07 DON budget are analyzed and results, in terms of use of the capability concept, are reported.</p>				
<b>14. SUBJECT TERMS</b> programmed objective memorandum, defense capabilities, planning programming budgeting and execution system, capability development process.			<b>15. NUMBER OF PAGES</b> 135	
			<b>16. PRICE CODE</b>	
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> UL	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)  
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**LINKING PPBES AND THE POM WITH CAPABILITIES**

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Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF BUSINESS ADMINISTRATION**

from the

**NAVAL POSTGRADUATE SCHOOL  
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## **ABSTRACT**

Recent Chairman of the Joint Chiefs of Staff Instructions (CJCSI) direct the development of new concepts to prioritize linking budgeting and programming for near- and mid-term resource allocation planning. For the Department of Defense (DoD), planning that falls within the Future Years Defense Plan (FYDP) or 0-7 years may be viewed as mid-term. This thesis raises the question of whether these new concepts will work best for the Department of the Navy (DON) or whether another methodology would better fit the Navy's near- and mid-term needs. Further, the thesis asks whether the implementation of the recently promulgated CJCSI instructions would be more disruptive to the DON instead of an alternative modification of what the DON is already using successfully.

This thesis also explores the potential value of the newly formed capability planning initiative within the DON. The Navy initiative is compared to private-sector practices to define similarities and to develop additional potentially useful methods. The thesis also explores the potential usefulness of linear programming or mathematical decision modeling for the application of weights and values to relate input variables and relationships to desired outputs. Finally, procurement narrative statements in the FY07 DON budget are analyzed and results, in terms of use of the capability concept, are reported.

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

BES	Budget Estimate Submission
CBA	Capabilities Based Assessment
CJCSI	Chairman of the Joint Chiefs of Staff Instructions
CJCSM	Chairman of the Joint Chiefs of Staff Manual
DoD	Department of Defense
DON	Department of the Navy
FAA	Functional Area Analysis
FCB	Functional Capabilities Board
FCP	ForceNet Capability Development Process
FYDP	Future Years Defense Plan
ICD	Initial Capabilities Document
IPL	Integrated Priority List
JCA	Joint Capability Area
JCIDS	Joint Capabilities Integration Development System
JFC	Joint Functional Concepts
JIC:	Joint Integrating Concept
JOC	Joint Operating Concept
JOpsC	Joint Operations Concepts
NAE	Naval Aviation Enterprise
NCDP	Naval Capability Development Process
NECE	Naval Expeditionary Combat Enterprise

NNFE	Naval Netwarfare ForceNet Enterprise
OPNAV	Office of the Chief of Naval Operations
OSD	Office of the Secretary of Defense
PPBES	Planning Programming Budgeting and Execution System
POM	Program Objective Memorandum
SPP	Sponsor Program Proposal
SWE	Surface Warfare Enterprise
USE	Undersea Enterprise

## **ACKNOWLEDGMENTS**

Colonel David A. Quinlan USMC Retired, 27 May 1938 to 7 November 2003, my late father-in-law who served two combat tours in Vietnam.

Suzanne Treadwell Quinlan, wife of the late David A. Quinlan and my mother-in-law who assisted me with editing this thesis.

Kristen Treadwell Quinlan-Boyce, my wife who unhesitatingly supported me during my research.

Captain Brian F. Boyce USN Retired, my father who spent 28 years in the Navy most of which was at sea, who also assisted me in editing this thesis.

Pamela A Boyce, my mother who made sure I finished all of my homework and got good grades in school, while my Dad was away at sea most of the time.

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# **I. INTRODUCTION**

## **A. PURPOSE**

The purpose of this thesis is to research linking the Programmed Objective Memorandum (POM) and Planning Programming Budgeting and Execution (PPBES) with capabilities. The reason for doing this thesis was a recent change of focus within DoD from focusing on programs to focusing on capabilities. In order to expand the amount of literature available on the subject, a fair portion of this thesis researched private sector capability planning efforts. In addition to the literature, three sources of information assisted in this thesis. Two information sources were from different warfare enterprises that are implementing a capability planning methodology; the third source of information was from OPNAV.

## **B. OBJECTIVES**

This thesis has three objectives. The first objective was to study the necessity to place the function of linking budgeting, programming and capability selection and planning at the top level of an organization. The second objective was to study the validity of linear or goal programming, i.e., mathematical decision models that possess assigned values to input variables in a relationship equation used to determine an output result, to be used as a tool to assist decision makers in resource allocation decisions relating to capabilities. The third and final objective was to perform a count and report results of scores under a hypothesis that if the Navy were committed to linking capabilities and budgeting then the words “*capability, capabilities, and capable*” would appear in the budget narratives of the Fiscal Year 2007 Procurement Budget narratives. Similar words were also counted as part of this analysis. The objectives were articulated in the initial proposal as the following:

### **1. First Objective**

It is hypothesized that if DON and DoD business leadership attempts to push any of the functions of goal setting/capability determination, capital investments decisions, and programming/budgeting to lower levels in the organization then it risks becoming dysfunctional because it will be much harder to coordinate all essential tasks. To the Navy, this assumption or hypothesis is directed at coordination of three decision

processes: managing capabilities (goal setting), JCIDS (capital investments), and PPBES (programming and budgeting) at the resource sponsor (business) level. For example, NAVAIR has an existing organization that performs this task, which could be an example of this process. Program managers in the Navy may wish to have this process implemented in their organization. The thesis will test the hypotheses above in the field, e.g., it will investigate the NAVAIR example as a case in successful implementation among other DON and DoD agencies to be determined.

## **2. Second Objective**

An intensive literature and real world set of data sources will be identified and studied with respect to whether a capability linear programming tool might be useful to assist decision makers and DON/DoD analysts. This model and analytic approach will be investigated to determine whether and to what extent it can assist decision making on resource allocation and acquisition. One example outside the US to be researched is how governments of Canada (British Columbia and other provinces) use optimization models in the area of maintenance of highways, and how these entities use a goal programming model to determine the maximum level of highway maintenance that is needed and can be provided relative to established standards and available funding. The inputs for highway maintenance are easily measurable as are outputs. How the DON/DoD might use of this type of model for resource and acquisition decision making is far more challenging. For the Navy and DoD to use such a model successfully it must meet their needs and overcome problems including data availability and managerial constraints. However, providing examples of successful capability or goal programming models for funding allocations will be of benefit in educating DON/DoD decision process and leadership.

## **3. Final Objective**

Data to be analyzed, at minimum, will include the Navy's FY07 procurement budget narratives with respect to what capability this particular program intends to provide. Some analysis has been done already in this thesis project research on a portion of the FY07 procurement budget narratives. Questions to be addressed in further thesis research include, for example, what percentage of APN budget narratives includes language and data about providing a capability? For those APN narratives that do not

mention a capability, what percentage mentions providing a mission or describes a function—or has no description at all? Finally, it will be determined what percentage only describes a weapons platform, e.g., a 44-passenger aircraft. The research then will compare and APN to SCN and other procurement budget narratives and report results.

### **C. SUMMARY OF RESEARCH AND ANALYSIS**

The research, analysis and conclusions aimed at achieving these objectives are organized into the following chapters:

Chapter I: Introduction

Chapter II: Literature Review, which addresses the first and second objectives.

Chapter III: Data Gathering and Analysis of narrative word counts which addresses the third objective.

Chapter IV: Private Sector Capability Configurations and their significance, which addresses the first objective.

Chapter V: Limitations in trying to solve multiple capability objectives with a goal programming approach which answers the second objective.

Chapter VI: Decision makers should choose priorities and be provided perfect information which addresses the first and second objectives.

Chapter VII: Analysis of the Naval Capability Development Process inside two Naval Warfighting Enterprise Pillars and the FYDP, which addresses the first objective.

Chapter VIII: Conclusion and Recommendations. The material used to answer the first and second objectives was literature and material provided from the three information sources. The material used to answer the third objective was a word count analysis of the FY07 Department of the Navy Procurement line item narrative statements. Work on this thesis was conducted from February through October of 2006.

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## **II. LITERATURE REVIEW**

### **A. INTRODUCTION OF LITERATURE REVIEW**

This section is a literature review of how large and complex organizations might be able to align budgeting and programming funding decisions focused on achieving certain capabilities as the primary objective (as opposed to a more traditional focus such as specific capital investments or increases in quantity of something or other) . Currently the Department of Defense is stressing budgeting and programming towards capabilities. This is evidenced by the recent publication by DoD of the Chairman Joint Chiefs of Staff Instruction 3170.01E on 11 May 2005. This instruction promulgated the need for a joint capabilities identification process to meet the needs of the future. (1) The services generally must live with the consequences of decisions they make about major equipment end items for twenty to thirty years. Poor decisions may impair both national security policy objectives and financial management. (2) To date numerous personnel working in the budgeting and acquisitions process within the Department of the Navy (DON) are struggling with trying to understand and implement a methodology to conform to the intent of CJCSI 3170.01E.

Since this process is still new to the military, it will be useful to provide a literature review related to the subject of capability and goal planning that has been implemented in public and private sector organizations in the past. The goal of this research is to provide insights to personnel working in the budgeting and programming sectors of the DON about how this process works and to have potential influence towards its development and implementation.

When studying literature that describes aligning budgeting and programming funds towards capabilities, a couple of themes emerge. First, adopting a new strategy is more difficult for large organizations than for smaller ones. Larger organizations tend to be more formally hierarchical and complex, whereas smaller organizations in some cases may still be able to operate through informal networks. (3) Second, successful implementation of strategic change in large organizations requires concerted efforts and attention at very high levels in the organization. Third, under certain conditions and with some effort, it is feasible to observe the effects of changes in funding on the performance

of certain capabilities. Finally, capability or related programming and budgeting seem to emerge when budgets are expected to be leaner and expectations of performance are not supposed to diminish. In that environment, when faced with budget reductions of a horizontal, across the board nature, lack of understanding the nature of core capabilities and inability to mitigate reductions in critical areas may undermine the organization's ability to succeed.

## **B. BACKGROUND INFORMATION ON CAPABILITIES**

This part of the literature review defines "capabilities" and illustrates some unique aspects or attributes that organizational capabilities possess. According to CJCSI 3170.01E Enclosure A, paragraph 2-f, a capability is defined as the following:

A capability is the ability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks.(4)

Resource-based strategies study the interactions with people and resources that create capabilities. Capabilities are created through the interactions of buyers and suppliers across an organizations value chain. (5) The value chain of an organization is the sum of all the primary mission functions and the supporting functions that an organization performs. (6) Capabilities are created through the use of people and resources in the performance of mission-related tasks. (7) Tasks that are performed poorly or do not achieve desired outcomes are unprofitable. On the other hand, tasks that are well executed and achieve desired outcomes are profitable. (8) However, we understand that in government there is no profit, so cost savings may be viewed as a proxy for profit.

### **1. Path Dependency and Its Development**

Of interest is the notion that organizational capabilities and information flow are path-dependent in their development. (9) That is, in the formation of a capability, there is a beginning stage where no one knows how to perform a certain set of practices through the application of particular technologies that will achieve or produce increasing returns or success. At this point, there might be more than one way of performing functions to achieve success. Some functions and technologies may be more efficient than others. Usually the finding of a particular methodology is affected by seemingly random events

such as the decisions made in staff meetings, unexpected early successes of certain equipment types, the knowledge that contractors possess, political influences, and so on. (10) However, once a favorable set of practices and technological applications are discovered, it is they are likely to be repeated, reinforced and learned throughout the organization. (11)

As time moves on, it may become harder to change methods in achieving increasing returns, even if other more efficient methods exists. Brian W. Arthur (1988) studied path-dependent development in increasing returns where certain practices over time become locked-in or hard to undo or change once implemented. (12) Titled "*Competing Technologies, Increasing Returns and Lock-in by Historical Events*," the article was published in the Economic Journal in 1989. (13) Arthur demonstrates the selection of one technological application over another where both applications accomplish the same result. Of interest is how the first application may be more efficient earlier to the user while a second, alternative process may become much more efficient to a future user. Since there are greater returns to initial users in the beginning with the first application, the first application is selected over the second one. (14) The selection of the first application is repeated until eventually it is standardized across the organization. The first application is selected because, at that time, it was perceived to have greater benefit to the users than the second application. (15)

The initial preference of one methodology over another may make it costly to change to an alternative method with the result that it becomes a "lock-in" and very hard to change. Lock-in means that it is possible to have inferior technologies used even though better technologies are available. An example of such lock-in is the standardization of the QWERTY keyboard and AC current. (16)

In an economy of increasing returns, a lock-in to one particular technological path makes it harder to adjust to a different path. (17) Often, relatively minor events or choices made in early stages can have significant impact. In the beginning of making a choice, it is sound to make more careful and well thought-out decisions. For example, history recounts arguments over the benefits of steam versus internal combustion (gasoline) engines in the early 1900s. (18) In retrospect, it is not known if any substantial benefit would have occurred if equal emphasis had been placed on steam engines. In the

increasing returns example, there is no guarantee that laissez-faire practices will enable the better technology to dominate. (19) In increasing returns instances, policy adapters choose technologies early on which suit themselves but may have put future holders of this technology at a disadvantage later on. (20)

The CJCSI 3170.01E instruction seems to be cognizant of this potential problem when it describes defining new capabilities to resolve warfighting capability gaps. Enclosure (A) paragraph 2-f of the order describes defining new capabilities:

In describing capabilities to resolve identified gaps, the following guidelines are instructive:

(1) Capability descriptions must contain the following elements:

(a) Key characteristics (attributes) with appropriate parameters and metrics, e.g., time, distance, effect (including scale)

(b) Obstacles to be overcome

(c) Supportability including Human Systems Integration.

(2) Capability descriptions should be general enough so as not to prejudice decisions in favor of a particular means of implementation, but specific enough to evaluate alternative approaches to implement the capability (21)

## **2. Defining Current Capabilities**

The above definition applies to defining capabilities focused towards warfighting gaps. However, if part of the process in budgeting and programming towards capabilities involves defining capabilities that are already in use then perhaps defining capabilities that already exist should be tailored in a similar fashion. That is, existing capabilities that existing systems and platforms contribute to should not be defined in favor of a specific platform. It may also be the case that in fulfilling certain capabilities certain platforms or systems may need to have their service life extended since no better means has yet to emerge to serve the function performed by this system. Such is the case of the service life extension of the Light Armored Vehicle that was described in the USMC gazette in September of 1998. Since this was a cost effective employment of resources since the existing equipment already achieved the desired capability performance, rather than to have to fund and research a complete new replacement end-item. (22)

## **C. CHALLENGES FOR COMPLEX ORGANIZATIONS**

The first common theme in literature about capability planning is that complex organizations are highly challenged when faced with adopting a new strategy of programming towards capabilities or goals. Most organizations do not have planning systems that link strategic planning with budgetary statements. (23) The main cause of this is budgets that are focused on the subunits of an organization instead of the organization itself. What becomes lost in this budgeting process is effective communication of budgetary objectives towards the entire organization's goals. Extreme cases will result in loss of effective coordination between departments of an organization. (24)

### **1. Maryland Public School System 1988**

In 1988, the Maryland public school system conducted a study to determine the feasibility of implementing a strategic planning methodology. (25) The study compared different sized school systems (26) and found that for larger school systems those with 20,000 or more students had the most problems with implementing a strategic planning process. Medium and small sized school systems were found to be successful in the implementation of this new strategy. (27)

In general, the following concerns arose. Managers held the opinion that the process was too labor intensive, however medium and small sized schools were able to succeed in its implementation. Large sized schools were not successful and believed that they required additional staffing to be dedicated towards this. A major conclusion was that top level managers in every school system did not have adequate understanding, time, and resources available to be dedicated to this process. (28)

The study concluded that the Maryland school systems need to overcome the following barriers in order to be successful in strategic planning:

1. Public Schools are more politically vulnerable than private sector businesses. Many of the public schools' major decisions are open to public forum. Managers in a school system therefore have to consider several different public viewpoints in making a decision, compared to the private sector manager who is mainly concerned with profits. (29)

2. Goals were ambiguous. Unless goals are clearly defined, they're almost impossible to measure. Feedback towards ambiguous goals has little value and might not even be relevant to the objectives of the organization itself. This makes it extremely challenging for managers to determine whether they're successful or unsuccessful. (30)

3. Lack of a clearly defined planning process. A timeline and schedule had not been implemented to achieve the required milestones. (31) Such milestones would be: an analysis of the environment, a determination of the schools current position, recognizing a need to make changes, the creation of a capability or strategy decision matrix, balancing the organizations strengths and weaknesses against the outside environment in relation to different capability courses of action, making a capability or strategic decision, implementation, and finally feedback. (32)

4. Personnel need to be trained in the process and adequate resources and time needed to be committed to support this process. Concurrently, political managers must approve of the allocation of resources towards this process and thus give more discretion to school system managers in budget decisions. (33)

5. Work needs to be done to illustrate the linkages between making a strategic change and the influence it will have on different parts and functions of the school system. Without this it will not be possible to make a prediction about the outcomes of a strategic decision and measure success of that decision with feedback. (34)

## **2. Planning and Coordination Challenges**

Planning becomes increasingly difficult as organizations increase in size. (35) As organizations grow they may need to adopt different planning methods than those that worked when the organization was smaller. (36) As organizations grow in size they become more complex and more departments with separate functions are created. Each department will have its own unique focus. Members of one department may have different values and objectives than members in other departments. Such divergent values and objectives make coordinated planning challenging. (37)

Coordination in large organizations tends to be more formalized and structured than in smaller organizations. In formal systems, rules and standards emerge for handling coordination. But any amount of rules and procedures will be unable to handle every possible situation. Therefore, the burden on management in handling coordination

increases as the size of the organization increases. Also, size tends to increase vulnerability to changes in the external environment, which further confounds the planning process. (38)

Eventually the number of new situations that emerge makes coordination among the varying levels of management ineffective. When this happens managers may implement a new strategy where coordination of the subordinate departments is focused on goals or objectives. These goals are expected to be developed congruently throughout an organization so the actions of the different parts of the organization will be more integrated. (39)

This type of coordinated planning requires tremendous effort, time, resources, and corporate knowledge. It usually entails the use of formalized processes and the assignment of dedicated personnel towards the coordination function as their primary responsibility. Subordinate units within the organization may participate in this process based on how much of their particular departmental expertise is required to successfully implement a strategy. (40)

#### **D. REQUIREMENTS OF TOP LEVEL-COORDINATION:**

The second common theme in the literature is that successful implementation requires concerted efforts and attention at very high levels within an organization. The Maryland Public School study states that a heavy investment and commitment is required towards strategic planning in order to make it successful. A way to accomplish this is to have dedicated teams of personnel that are part of the organizations' administrative structure. Top level managers should identify who is tasked with strategic planning and clearly define what their responsibilities are. (41)

##### **1. Budgeting with a Departmental Focus**

When budgeting has a departmental focus rather than an organizational focus, communication within an organization suffers. Having a departmental focus increases risk of a breakdown in coordination between different staff members. (42) There is a method that can link strategic planning with financial statements. It is the process of determining strategic goals, developing and programming action plans (programming), with the final step to develop a budget. (43) If the steps of programming and budgeting are disconnected it is possible that an organizations' programs will not be aligned with its

departmental structure. (44) Conversely, if the processes of aligning strategic goals and objectives with programming are done successfully, then the budgeting process should involve very little work, since it will only have to support what was produced in programming. (45)

## **2. Two-Tiered Planning Example by McCaffery (1984)**

Such a process existed in Canada in 1984, where a two-tiered strategic policy making and budgeting process known as the “Envelope Budget System” was used (46) This system described by McCaffery, (1984) had two levels of decision making. The top level, which consisted of the highest appointed government officials, establishes broad strategic goals and plans. Beneath this organization, were four committees, each charged with overseeing two policy areas, such as national defense or social welfare. This system was designed to enable multiyear planning and policy initiatives in an orderly manner. (47)

This two-tiered committee system for financial planning had large scale grand priorities being developed at the top level, and micro-priorities developed at the committee level covering the policy sectors assigned through the allocation of policy envelopes. New proposals or initiatives percolated up from departments to the committees for review. This two-level system was able to produce a political analysis and strategic planning. It could can provide answers to questions such as if you do X next year, will our organization be required to do Y, or how many units should we produce next year if we need to accomplish objective X. (48) Elected politicians participated in the top level and full-time civil servants comprised the committee level. (49) All of this is in the past and no longer used but it is still a good example for this chapter.

## **3. University Goal Setting Example**

A similar process was implemented by university systems. Here the head of the university system set overarching goals for the organization and the individual presidents or deans of each school system either produced or had personnel directly working at the top level of the school determine more focused operational type goals to fit the intent of the whole university system’s broader goals. (50) This implementation was successful



enough to enable a linear programming model, which proved to be beneficial. Further discussions on the efforts in university systems are found later in this chapter.

#### **4. Planning Decentralization Creates Satisficing**

When strategic planning is decentralized, linking budgets with top-level objectives has greater risk of dysfunction. Incremental planning emerges when it becomes too challenging to satisfy top-level objectives in a decentralized structure. (51) A number of flawed processes occur when decentralizing planning leads to establishment of incremental decision making. These flaws (such as “satisficing” – described below) occur because lower level planners may only understand a few tasks, information costs are high, and it is difficult to coordinate effort among organizational sub-units. (52)

Satisficing is the selection of courses of action that may be sub-optimal but are good enough in the eyes of the organization. An individual faced with numerous problems to solve may choose to satisfice several of them to save time and effort. (53) Individuals may possess limited understanding of their environment and may only be able to focus on a few things. This lack of full understanding can have a negative outcome on making a decision. Finally, information is expensive, (54) not necessarily in terms of dollars, but in terms of the time it takes to gather and analyze it. The cost of information is the opportunity cost in time for the individual. When time is limited (as it so often is) the choice has to be made to spend time looking for an ideal solution to one or two problems or achieving good enough solutions for several. (55)

The above paragraph argues for planning to be more centralized than decentralized. Limited cognitive abilities and time constraints impede lower level planners’ ability to make optimal goal selection for the organization. Therefore, it is in the best interest of the organization to take on the role of planning at the organizational level, since it cannot expect to optimize strategy by decentralizing its planning function. Execution could be decentralized once planning is completed. Planning is the responsibility of the top levels of the organization. Top level planning will prevent planning within functional stovepipes.

#### **5. Game Theory and Incrementalism**

Related to this point is the study of game theory done in the late 1960s; specifically games with incomplete information. (56) Traditional game theory was

grounded in the assumption that decision makers within a particular game were highly aware of their surroundings in making their decisions. Harsanyi won the Noble prize for his research in game theory with incomplete information. (57) A significant finding of his work is that selection of strategy by the decision makers in a game is different when information is incomplete compared to when information is complete. (58)

Incremental planning within organizational sub-units or stovepipes is less likely to be connected and uniform across an organization, because of the lack of information available to lower level planners. Planners are unable to consider the effects of their decisions on other players and the effects of their decisions on the organization as a whole. In situations where a comprehensive analysis is impossible, people will make minor incremental adjustments in order to placate higher-ups. Small adjustments are most likely to be made since, if they have a negative impact, they can be easily changed or reversed. (59) These small changes may or may not be in the best interest of the entire organization (60) and may be implemented solely because the only information available to the planner is that higher authority is not pleased with the status quo.

Furthermore, incremental decision-making may not be a single step process within a certain time period. If a decision is made incrementally and it is not correct, then another incremental decision will be made. Tragically the state of being good enough may only mean that pressure from higher up no longer exists. Another aspect of this decision-making process is that not all available alternatives may be analyzed. The bottom line of incrementalism is that this decision-making processes will simply continue to cycle through decision-making until a good enough outcome has been achieved, (61) time has run-out, or the higher authority has to divert attention elsewhere.

## **6. Summary of Challenges**

Some organizations may be so large and complex that it is impossible to contain all planning, programming, and budgeting decisions within the highest one or two levels of the organizations' structure. In that case the scope of the organizations structure requires that it have additional staffs at lower functional levels such that the actions and decisions executed at the lower or functional level would be extensions of decisions made at the higher integrated operational level. (62)

This approach still allows large complex organizations to resemble possessing a two level planning system with the top level focused on overall long term strategic goals and policy objectives and the next subordinate or operational level translating those objectives into action programs and budgets in the near term. This methodology is more efficient since the objective is to still have budgeting and programming decisions at the highest organization levels, which enables greater congruency between all of these decisions. (63)

## **E. MATCHING CAPABILITY PERFORMANCE TO FUNDING LEVELS**

The third theme that came up in the literature is that it is possible to assess levels of performance that can be matched with funding levels through mathematical programming applications. This is much easier to do when inputs towards objectives are easily measurable. Goal programming for highway maintenance has been used in both the United States and Canada. It can be assumed that the inputs for highway maintenance are very tangible (e.g. tons of gravel, asphalt, machine hours of paving equipment, etc.) so building a planning model program for maintaining highways is feasible. (64)

### **1. Mathematical/Linear Programming Methods**

More abstract than highway planning is the use of mathematical programming methods towards goals in a university system. The university system achieves goal programming by performing it at two levels, division level and department level. At the departmental level each function of the division is broken up into different weights and values. (65) The aggregate sum of a department's missions is represented at the division level in a single variable. (66) Since goal programming in universities is more subjective than highway maintenance, it was implemented with a two-step strategy. The top management of the school system set overarching broad goals for the entire school system. These goals were sent to the subordinate levels where the top management of the subordinated organization divided their organizations missions into goals that supported the goals of the entire university system. (67)

Goal programming in U.S. and Canadian highways was found to be useful due to the large amount of data involved and the ability to measure activities such as paving and resources such as raw materials required. (68) The financial planning model can be used to determine the minimum amount of funding required to achieve and maintain specified

maintenance standards. This is done to justify requests given to the government for funding since they must be justified as being required to sustain an agreed upon level of serviceability. (69)

Goal Programming is done through a linear programming model that measures the allocation of capital budgets. (70) This model can measure whether a particular goal has been met or, if it hasn't been met, how much this goal has been underachieved. The function treats all goals as being equally important. The objective of the model is to minimize the amount that specific goals are underachieved. (71)

Goal programming is done through a two step process, the first step is determining the required finances and the second is to determine an achievable level of service. (72) Rarely is it the case that budgets received are budgets requested. When this is the case then step two of minimizing the underachievement of specific goals will prove to be the more purposeful. (73)

## **2. Subjective Goal Programming Example**

The goal programming model used in the university system achieved the same purpose as the highway programming model. However its inputs certainly were more abstract and were left to the discretion of top level managers and planners. The purpose of the universities goal programming model was to create optimal portfolios of different budget cut options. An optimal budget cut package is one that minimizes goal reduction. Presenting top level management a group of alternative reduction strategies allowed for greater decision making flexibility. Even though its formulation was subjective, when it was tested against university systems that did not have such a model, more economical resource allocation decisions were made with the universities that utilized a goal programming system. (74)

## **3. USAF Resource Allocation Model**

Within the Department of Defense, the U.S. Air Force has proposed a Resource Allocation Model to be used for capability planning for aircraft maintenance. (75). This example illustrates how capability planning could occur at the departmental level. The article claims that in finding the abstract translation for what a capability that supports aircraft maintenance was, the author proposed that elements of its definition were located inside the Status of Resources and Training System (SORTS) Reports. (76)

SORTS reports state levels of combat readiness, and at this time it is the maintenance units that provide the inputs regarding what is most valuable for supporting aircraft maintenance. Currently maintenance units are asking for certain amounts of funding to perform functions that they determine are most necessary. What is not happening is determination at the Major Commander or Flag Officer Level of how much maintenance capability is affordable with current budget limits, allocating funding towards that capability, and then receiving that capability (77).

Currently in the United States Air Force (USAF), SORTS reports demonstrate that funding 100% combat readiness is too costly. However, it is feasible to fund less than 100% readiness but still be effective enough to be determined mission capable. The main issue is uncertainty about how to optimize funding allocations in achieving mission capable readiness. Not surprisingly, in this atmosphere of uncertainty, funding reduction questions usually receive non-uniform, subjective responses from different respondents. (78)

Given the complexity of influences on budgeting, it is often hard to pinpoint reasons why particular programs receive funding over other programs. There is no model or metric that explains why particular programs are funded and others are not. Currently organizations' funding shortfalls are not readily translated and seen by budget decision making personnel at higher levels. In order to be successful in obtaining funds, logistical requirements will need to be translated into language that is meaningful to budgetary decision makers. (79)

A method provided by the USAF to translate this is the Resource Allocation Model (RAM). The RAM is usable at the USAF Major Command level for collecting inputs, establishing priorities, and determining which shortfalls are funded or not funded within budget constraints. The RAM is based on fundamental capability values which are the result of decisions based on inputs from all relevant stakeholders. (80) Here a capability is described as having a range from 0 to 1.1. A fully operational capability achieves a scale of 1.0. An over-operational capability is reported from 1.01 to 1.10. Between .85 and .99 a capability is functional. Between .70 and .84 a capability is in a caution zone, where it is degraded but still functional. Capabilities scoring less than 0.7 are considered not mission capable. (81)

In order to achieve these capability measurements there is also a need to quantify violations against performance, which can occur if under-funded. Some violations are more severe than others and therefore carry more weight. (82) Perhaps generating these values is somewhat subjective in nature, but if these measurements are applied uniformly it may at least establish a standard. This example provides an illustration of violations which occur in funding an activity responsible for aircraft maintenance. Some of these violations are:

- 0.1 capability loss from cost cuts in washing aircraft
- 0.2 capability loss from cost cuts in painting aircraft
- 0.3 capability loss from cost cuts in preventive maintenance inspections
- 0.4 capability loss from cost cuts in corrective maintenance functions. (83)

When starting from a fully mission capable maintenance activity of 1.0, taking funds away from the corrective maintenance function would make the maintenance facility less than capable in performing its mission since it would leave it with a rating of 0.6. The most likely course of action for a funding reduction with these weights would be to reduce the funding for washing aircraft first, since this would appear to be the least critical maintenance task. (84)

Establishing capability performance levels in this fashion serves to achieve the following objectives. First, the causes of reductions in capability level are identified. Second, funding shortfalls can be prioritized based upon their impact on its capability. Third this method fits within the resource allocation process where funded or unfunded shortfalls are determined within a budget constraint. Lastly, the money allocated to a shortfall is retraceable; meaning the money or lack of money provided towards a capability can be traced to its effects.

Having a system that tracks the distribution of money with its effects facilitates greater economical planning towards allocation of resources in future decisions. When successfully implemented this process of tracking monetary distributions will develop a history that will provide feedback. The feedback becomes available to further improve the process. (85)

## **F. CAPABILITY PLANNING AND DECREASING BUDGETS**

The final theme is that capability or goal programming may be implemented in anticipation of funding reductions. Both the U.S. and Canadian highway example (86) and the goal programming in university example demonstrate that such strategies are used in times when funding is expected to be limited in nature. (87) The intentions of such models are to produce the maximum achievable level of performance within a given budget. By having this information budget requests become more justifiable since they will be matched with achieving certain levels of productivity deemed necessary politically. (88)

A properly functioning capability budgeting system will ensure that effects of funding cutbacks do the least harm to essential mission functions. (89) Proper strategic planning will allow properly focused cut-back decisions. This may be compared to an across the board horizontal cut which pays almost no attention to high impact efficiency losses in certain programs or capabilities.

According to Zakheim and Ranney (1993), in the 1990s SECDEF and the President of the United States (POTUS) realized that threats to the United States are different than in previous decades(90). It was also seen that, in the future, it might become necessary to downsize the military to be able to successfully fund other domestic programs. (91) Should available funding for defense decrease but demands for U.S participation in foreign policy not decrease, then it may be the case that the ability of the U.S. to continue to participate in foreign policy may become compromised. This compromise may occur if, in the process of reducing the defense budget by making force reductions in warfighting potential, highly essential capabilities towards meeting existing post cold-war threats are reduced, due to a lack of understanding of budget versus capability. Such may be the case in a horizontal reduction in force that produces a smaller version of the cold-war military. (92) In fact, the result of many across the board cuts taken by DoD in the 1990s reduced warfighting capability. As a consequence, DoD was not prepared to fight the global war on terrorism and its budget has had to be increased and augmented by supplemental war related appropriations considerably in the 2000s. (93)

## **G. CONCLUSION OF LITERATURE REVIEW**

Capabilities are the outcomes of interactions between personnel, equipment, and procedures in the performance of an organization's mission. (94) Successful capabilities once learned may tend to become ingrained within an organization. Once ingrained these may be too hard to change within an organization. This is because successful practices will quickly spread through an organization especially if accomplishment of objectives through its adoption has a measurable impact. In this situation a less efficient methodology may be selected through random events and its initial success over a possible alternative process reaps greater rewards in the short term but not in the long term. (95) Therefore, in defining new or existing capabilities, the definitions used should be as unbiased as possible. (96)

Research suggests that organizations are most successful when the processes of goal setting, programming funding decision making and budgeting are integrated. Hierarchical and complex organizations may have greater challenges in implementing this approach than smaller sized organizations. (97) Complex organizations need to ensure that they dedicate personnel towards this process at two levels, the uppermost level and subordinate areas directly below the top level. (98) Top level planners provide a general focus towards goals and make macro-level decisions that affect the organizations beneath them. The subordinate organizations have the more challenging task of defining specific capabilities that contribute to the objectives of the top level. (99)

Highly successful implementations of capability planning can forecast actual levels of performance with available funding. One way this is done is with linear programming. It may be the case that the inputs are very easy to measure such as units of raw material and machine hours. (100) In the event that it is not easy to measure input units the act of defining measurement variables is performed through a two-step methodology in complex organizations. Here the top level develops broad objectives and the units directly subordinate to the top level develop specific goals and measurements in support of the top levels objectives. Although these measurements may be subjective in nature; when tested, organizations that had implemented a planning model, compared to those that had not, made more economical decisions which minimized loss in



performance. (101) However, not in every case is it economically useful to utilize goal or linear programming due to competing work-loads and relationship definition complexities. (102)

It may be the case that capability planning strategy is now being implemented in the face of future budget constraints. If funding cuts drive reductions in force size and no analysis is done on the effects of the ability for the DON and other services to perform certain essential tasks or functions, readiness may be impaired when it need not have been. A highly functional capability planning system will help ensure that funding reductions have minimal impact on organizational performance. (103) Without a highly functional system and understanding of capabilities, an organization leaves itself vulnerable to greater risk in the face of budget reductions.

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### III. DATA GATHERING AND WORD COUNTS

#### A. INTRODUCTION

One of the hypotheses of this thesis was to prove that the Navy is or is not currently linking budgeting and programming towards capabilities. The underlying assumption of this hypothesis was if capabilities and budgeting and programming were linked then the word “*capability*,” “*capabilities*,” or “*capable*” would appear in the narrative descriptions (104) for the budget line items in the 2007 procurement budget line item statements as evidence of the level of performance of this linkage. These words appearing in the narratives are assumed to illustrate evidence or managerial interest towards describing a budget towards a capability.

Data was gathered via word search for the following word groups:

*Capability or capabilities,*  
*Capable,*  
*Mission or Missions,*  
*Function, Functional, Functions, Functioning or Functionality,*  
*Provide, Provides or Provided.*

This word search was conducted only in the narrative descriptions found in the first pages of each line item budget described in the FY2007 procurement budget documents on the Navy’s PBIS website. The budget summary highlight books were not counted in this analysis. These word groups may have appeared in other parts of the different line item budgets but were not counted as being part of the narrative description in this study. The primary rule in counting a word was that it was relevant to the descriptive paragraphs of the narrative itself. The assumption of gathering this data was that if budgeting and programming were linked to capabilities then the words “*capability*,” “*capabilities*” or “*capable*” would show up in these narrative statements as evidence of linking budget descriptions to capabilities. In order to be more thorough, other words relating to “*mission*,” “*function*” and “*provide*” were counted. Subjective interpretations may have impaired some of the decisions to count or not count words. For example it was realized that the word “*providing*” was not included as a provide word.

To provide a higher amount of results for all word categories, when counting for the words the total amount of occurrences where each particular word type appeared in

the narrative were recorded for every line item. These were then averaged across each procurement area. For example Procurement Z has three line item narratives and when counting for the occurrence of the word “*capable*,” it appeared zero times in the first line item, three times in the second line item and one time in the final line item; therefore the average occurrences of the word “*capable*” in Procurement Z are 133%, 1.33, or 4/3. That is, the target word appeared an average of 1.33 times per budget line item. In addition to this scoring effort, the number of line items that had one or more instance of a test word was reported. For the case of Procurement Z, three line items this result would be that the word “*capable*” appeared in two out of the three line items.

## **B. TEST ONE**

The first test was to determine the amount of occurrences of the test words. Results are the following:

(1) For APN (Aircraft Procurement Navy), 252 line item narratives were analyzed. Results of this analysis were the following: on average the words “*capability or capabilities*” scores 103% across 252 APN narratives but only appears in 124 narratives, “*capable*” scores 14% across all APN narratives but only occurs in 29 of them, the words “*mission or missions*” scores 92% across all APN narratives but only occurs in 114 narratives, the “*function*” words score 14% across all APN narratives but only appear in 28 narratives, the “*provide*” words score 128% across all APN narratives but only appears in 149 narratives.

(2) For OPN (Other Procurement Navy) 861 line items descriptions were analyzed. Results of this analysis were the following; on average the words “*capability or capabilities*” scores in 44% of OPN narratives while occurring in 226 of them, The word “*capable*” scores 6% and appears in 46 narratives. The “*mission*” words score 22% and appear in 129 narratives, the “*function*” words score 10% and appear in 69 narratives, the “*provide*” words score 93% and appear in 423 narratives.

(3) For SCN (Ship Building and Conversion Navy) 204 line item descriptions were analyzed. Results are; “*capability or capabilities*” scores 18% and appear in 28 narratives, the word “*capable*” scores 5% and appears in 9 narratives, 19% the “*mission*” words score 19% and appear in 21 narratives, the “*function*” words score 3% and appear in 5 narratives, and “*provide*” words score 34% and appear in 45 narratives.

(4) For PANMC (Procurement of Ammunition Navy and Marine Corps) 280 line item descriptions were analyzed. Results of this analysis are the following; the words “*capability or capabilities*” scores in 5% and appears in 12 narratives, the word “*capable*” scores 1% and appears in 3 narratives, the “*mission*” words score 4% and appear in 11 narratives, the “*function*” words score 4% and appear in 12 narratives, and the “*provide*” words score 34% and appear in 70 narratives.

(5) For PMC (Procurement Marine Corps) 473 line items descriptions were analyzed. The results of this analysis are the following; the words “*capability or capabilities*” scores 40% and appears in 130 narratives, the word “*capable*” scores 10% and appears in 36 narratives, the “*mission*” words scores 13% and appears in 48 narratives, the “*function*” words score 6% and appear in 26 narratives, and the “*provide*” words score 70% and appear in 219 narratives.

(6) For WPN (Weapons Procurement Navy), 88 line item descriptions were analyzed. Results of this analysis are the following; the words “*capability or capabilities*” score 35% and appear in 19 narratives, the word “*capable*” scores 7% and appears in 6 narratives, the “*mission*” words score 22% and appear in 17 narratives, the “*function*” words score 0%, and the “*provide*” words score 61% and appear in 38 narratives.

(7) For all of the combined procurement line items narrative descriptions, 2158 line item descriptions were analyzed in total. Results of this analysis are the following; the words “*capability or capabilities*” scores 42% and appears in 539 narratives, the word “*capable*” scores 7% and appears in 138 narratives, the “*mission*” words score 25%, and appear in 340 narratives, the “*function*” words score 8% and appear in 140 narratives, and the “*provide*” words score 76% and occur in 944 narratives.

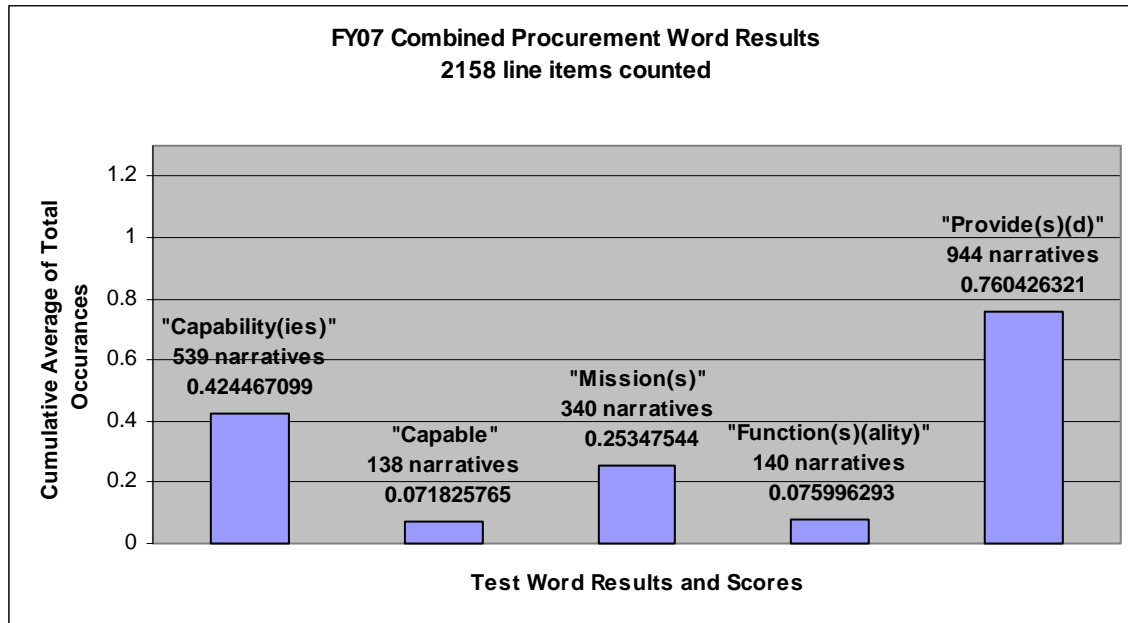


Figure 1. Combined word search results for the sum of all six FY07 Navy Procurement Categories.

The conclusion for the data gathering within the first test under the assumption is that if the Navy was currently linking budgeting and programming with capabilities, then the words “*capability*,” “*capabilities*,” and “*capable*” would appear in the FY07 line item procurement narratives as evidence, is that this is not occurring. The other word results illustrate further differences in the wording of the narratives between procurement areas. The sample size of this test is large enough so that any subjective misinterpretation made in gathering the data is not likely to change the outcome. All test means possessed more than 90% statistical accuracy.

### C. TEST TWO

A second test conducted was to count those items that did not contain the combination of the words “*capable*,” “*capability*,” or “*capabilities*” the following but did possess the other test words. Results of this second test are:

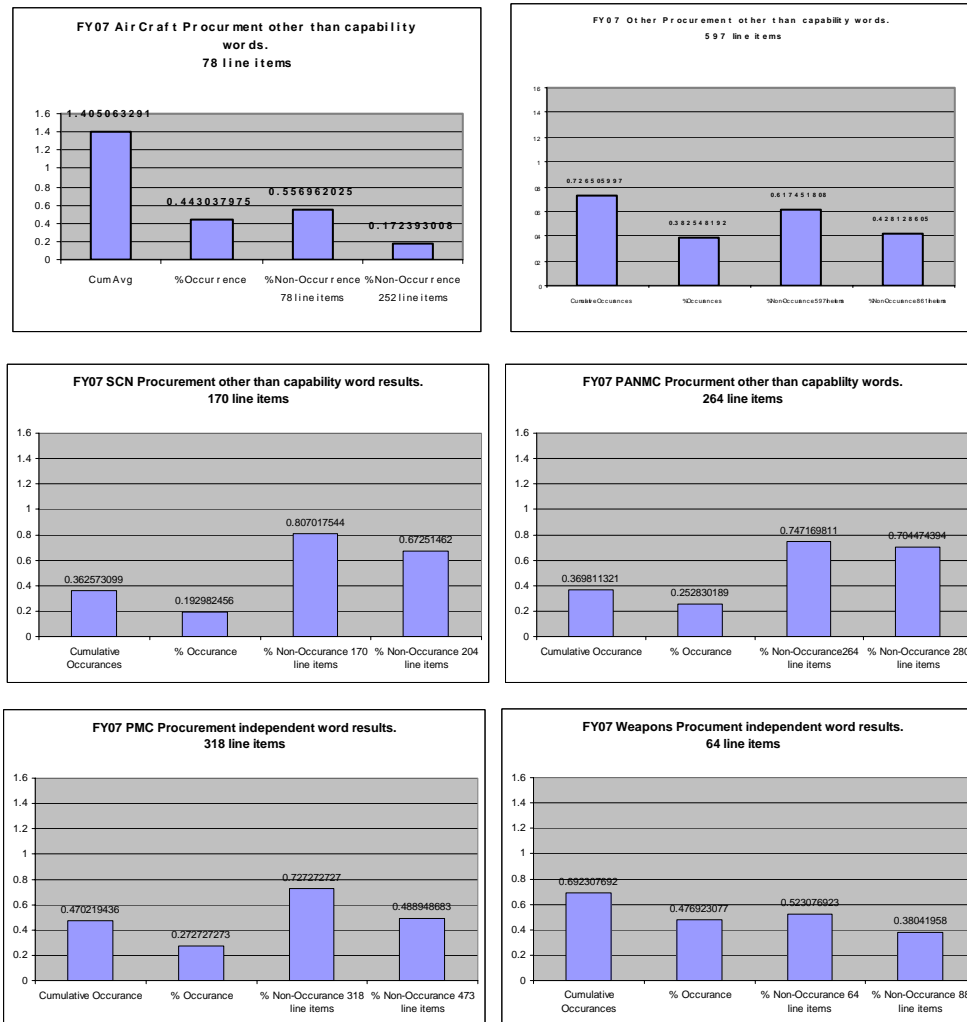


Figure 2. Other than capability word results for six procurement types. From left to right, first column cumulative averages of other words, second column is the percentages of line items with other test words, third column percentages without, final column total percentage without for entire procurement area.

Below are narrative explanations of the second test results:

(1) For Aircraft procurement Navy, 78 of 252 line items fit this criterion of having the other test words besides “*capability*,” “*capabilities*,” or “*capable*”. Of these 78 line items the cumulative average of occurrences of the other test words, “*mission*,” “*function*,” “*provide*,” was 141% (column one), where 35 of 78 or 44.3% had at least one or more of the other test words (column two), and therefore 43 of 78 or 55.7% did not (column three). For the entirety of Aircraft Procurement Navy 43 of 252 or 17.2 % of

the line items did not contain any of the test words “*capability*,” “*capabilities*,” “*capable*,” “*mission*,” “*function*,” and “*provide*” (column four).

(2) For Other Procurement Navy, 597 of 861 line items fit this criterion. Of these 597 line items the cumulative average of other test words was 72.7% (column one), where 229 of 597 or 38.3% had at least one or more of the other test words (column two), and therefore 368 of 597 or 61.7% did not (column three). For the entirety of Other Procurement Navy 368 of 861 or 42.8% of the line items did not contain any of the test words (column four).

(3) For Ship Building and Conversion Navy 170 of 204 line items fit this criterion. Of these 170 line items the cumulative average of other test words was 36.3% (column one), where 33 of 170 or 19.3% contained at least one or more of the other test words (column two), and therefore 137 of 170 or 80.7% did not contain any of the test words (column three). For the entirety of Ship Building Procurement Navy 137 of 204 or 67.3% of the line items did not contain any of the test words (column four).

(4) For Procurement of Ammunition Navy and Marine Corps 264 of 280 line items fit this criterion. Of these 264 line items the cumulative average of the other test words was 37.0% (column one), where 67 of 264 or 25.3% contained at least one or more of other the test words (column two), and therefore 197 of 264 or 74.7% did not contain any of the test words (column three). For the entirety of Procurement of Ammunition Navy and Marine Corps 197 of 280 or 70.4% did not possess any of the test words (column four).

(5) For Procurement Marine Corps 318 of 473 line items fit this criterion. Of these 318 line items the cumulative average of other test words was 47.0% (column one), where 87 of 318 or 27.3% contained at least one of the other test words (column two), and therefore 231 of 318 or 72.7% did not contain any of the test words (column three). For the entirety of Procurement Marine Corps 231 of 473 or 48.9% did not contain any of the test words (column four).

(6) For Weapons Procurement Navy 64 of 88 line items fit this criterion. Of these 64 line items the cumulative average of other test words was 69.2% (column one), where 31 of 64 or 47.7% contained at least one of the other test words (column two), and



therefore 33 of 64 or 52.3% did not contain any of the test words (column three). For the entirety of Weapons Procurement Navy 33 of 88 or 38.0% of the line items did not contain any of the test words (column four).

#### **D. TEST THREE**

The final test was proposed to analyze which narratives only describe a weapons platform or system only or have no description at all. For the most-part no data other than speculation of narratives could be obtained for this analysis. The most cost-effective non-biased conclusion available due to resource constraints and high information costs balanced with relevance towards the efforts in learning and understanding the capability planning process, for this proposed test are the results of test two pertaining those platforms that do not possess any occurrences of the test words across the scope of the entire procurement category or the column four test results. Under this criterion results of this test are the following:

(1) For Aircraft Procurement Navy 43 or 17.2% of the 252 line items did not contain any of the test words.

(2) For Other Procurement Navy 369 or 42.8% of the 861 line items did not contain any of the test words.

(3) For Ship Building and Conversion 137 or 67.3% of the 204 line items did not contain any of the test words.

(4) For Procurement of Ammunition Navy and Marine Corps 197 or 70.4% of the 280 line items did not possess any of the test words.

(5) For the entirety of Procurement Marine Corps 231 or 48.9% of the 473 line items did not contain any of the test words.

(6) For the entirety of Weapons Procurement Navy 33 or 38.0% of 88 line items did not contain any of the test words.

#### **E. CHAPTER SUMMARY**

The effort in gathering this data was done primarily to provide an analytical background to gain perspective to write this thesis on linking capabilities and budgeting. The data itself proves nothing more than a large enough percentage of the procurement budget narratives do not possess the words capable, capability, or capabilities as substantial evidence to prove that budgeting and programming are linked to capabilities

of any particular kind. The inclusion of the capability words and the other test words does show evidence of management attention to narrative wording in different procurement areas. However, one could easily argue that other words could describe capabilities such as task, role or contribution. The data gathering took more than 60 labor hours and was done in late June and early July of 2006. The data may be potentially biased in its methodology of word selection since the FY07 Aircraft Procurement narratives were studied prior to gathering the data.

The remaining thesis chapters were developed through asking the points of contact about the current nature of capability planning within the Department of the Navy. These efforts along with literature research contributed to most of the findings. The word count analysis was beneficial for providing a background about towards the scope of the DON budgeting effort.

## **IV. SIGNIFICANCE OF PRIVATE SECTOR CAPABILITY CONFIGURATIONS**

### **A. INTRODUCTION**

This chapter describes the role of capability configurations in identifying, developing and applying capabilities for an organization. Capability planning is derived from the resource-based perspective of management strategy in private sector firms. (105) In capability planning a firm's assets both tangible and intangible (106) are analyzed and defined as means to achieve success in a competitive atmosphere.

This type of planning is highly detailed and intensive and requires a total analysis of the organization involved coupled with a huge amount of consensus across the entire scope of the organization involved in the application of the capability definitions. (107) Due to the rigor of this task a dedicated function group of top-level personnel that are defined as capability configuration should be created to perform this task. (108) Very recently the Department of the Navy has adopted a form of this strategy for developing war-fighting capabilities. At least two organizations within the Navy have adopted a form of a capability configuration to perform this task at their organizational level. (109) Although this chapter focuses on private sector practices, it mentions similarities that exist within the Department of the Navy.

This chapter will first provide background into the definitions and terms utilized by private sector capability configurations. Second, it will provide a summary of the management perspective of capability planning and illustrate similarities within the Department of the Navy. Lastly, this chapter will illustrate the processes utilized by private sector firms for this endeavor.

### **B. BACKGROUND**

Strategy literature since the 1980s makes the claim that there are two different sources of competitive advantage that an organization, firm, or business, can utilize. The first source is from positioning advantage and seizing opportunities. The second source is from the concentration and utilization of valuable resources required to sustain competitive advantage. (110)

The second source is known as the resource-based strategy, and it is from this strategy where development of capabilities is based. In the resource-based view of strategy, performance is linked to skills, resources, and capabilities possessed by an organization which are difficult for its competitors to imitate. (111) Firms, businesses, and organizations create and sustain advantages through developments in efficiency, effectiveness, improving organizational economics, the researching of technological change and organizational change. (112) This resourced-based perspective recognizes but does not attempt to explain the nature of the isolating mechanisms that enable competitive advantages to emerge. (113) Finally, neither the resourced-based perspective, nor the positioning perspective by themselves are able to completely explain or provide all of the required knowledge needed to determine how an organization, business or firm can succeed and continue to succeed. (114)

### **1. Summary of Private Sector Terminologies**

Asymmetrical characteristics, which are the foundations of capabilities, are the means that an organization employs to achieve advantage. (115) These characteristics consist of outputs or services, routines or standard operating procedures, knowledge and expertise, assets, and relationships. (116) Asymmetrical characteristics are processes, expertise, relationships, skills, assets, or outputs that an organization produces, that are most likely to be imitated by its competitors. These generally do not produce any advantage but possess the potential to be transformed into resources or capabilities. (117)

Asymmetrical characteristics become capabilities when they are developed through identifying, building and leveraging expertise, contacts or interactions, and assets that provide a positive imbalance that favors the organization. To be considered asymmetrical characteristics these must be unique to the organization or be challenging to mimic by competitors, thus making them asymmetrical in nature. These attributes are often hidden (overlooked or undiscovered) within an organization. When hidden these characteristics are not likely to be connected with the creation of value within an organization, business, or firm. If these characteristics remain hidden their potential for creating value will never be realized. Therefore, exploring the causes or sources of what creates resources may have merit. (118)

Resources are asymmetrical characteristics that currently produce superior results. These include reputation, technical skills, scarce resources, exclusive alliances (119) and low cost suppliers. (120) Resources also enable a firm to make strategic decisions. Resources come in three types: physical, organizational, and human. (121) Physical resources are tangible resources that are namely equipment, property, and items of technology. Human resources refer to training and experience possessed by service members. (122) Organizational resources are the internal systems that an organization uses to function as well as the organizations reputation or image. (123)

The search for and/or the desire to retain competitive advantage entails numerous decisions regarding the intended usage of existing assets and the development of new assets to perform future tasks. (124) Resourced-based strategies state that strategic decisions should be guided by an understanding of the unique resources that an organization has. An audit of all available resources should be performed by the capability configuration. This audit will provide a large list of assets that produce varying degrees of strategic relevance. (125)

Capabilities are more valuable than resources. Capabilities relate to the ability to create resources or to apply resources in such a way that makes them more valuable or sustainable. This can include expertise, tacit knowledge, administrative routines, operational routines, innovative abilities, and operating ability. (126)

Core capabilities, also referred to as core-competencies, are those capabilities that are the most essential to an organization's competitive advantage. These are often applied across different products and markets. Core capabilities are systematic and may comprise or orchestrate other lesser capabilities. This aspect of core capabilities gives them a greater sense of uniqueness and value. (127) Core capabilities facilitate (128) the creation of sustainable competitive advantages. (129) These typically have knowledge based or technological aspects. (130) An effective core capability is something that an organization can base all of its actions and management decisions towards, such as the acquisition of capital or the training of personnel. (131)

Core capabilities are defined as having four dimensions: employee skills and knowledge, technical systems, managerial systems, and the values and norms of the organization. (132) Employee skills and knowledge bear the closest relationship to new

product development. Technical systems are the results of quantifying, decoding and building structures out of tacit knowledge. This process may take years to accomplish and is often the combination of several inputs of different sources of tacit knowledge across the span of the organization. (133) Therefore, if applied and accumulated and applied properly a technical system built from tacit experience will be of great value. Managerial systems are both formal and informal methods of controlling knowledge. These evolve over time through the interactions of managers, employees, and the organizations rewards systems. Finally, values are the corporate culture of the entire organization; these typically originate from the ideals of the organizations founding leaders. (134)

### **C. MANAGEMENT PERSPECTIVE OF CONSENSUS BUILDING**

#### **1. Capability Configuration**

A capability configuration will be faced with two primary challenges when implementing a resource-based strategy. The first challenge is the sorting out of all resources possessed, and identifying those that are sources of competitive advantage. The second challenge is coming to agreement upon the application of selected resources. (135)

#### **2. Objective of a Capability Configuration**

The objective of a capability configuration is to determine what core capabilities the organization possesses or needs to possess. Not only must core capabilities be selected, the capability configuration must reach consensus on their definitions. (136) Without consensus a functional decision making process for making resourced-based decisions is not likely to occur. (137)

Consensus building within management is certainly not a fresh topic of research. Most research has focused on consensus building towards an organization's goals or objectives, or about the nature of the external environment of a firm. In this research the achievement of consensus has been positively correlated to a number of factors of performance. (138) To date research on consensus building on the utilization and planning of firm resources and capabilities has not been studied as heavily, but the results of performance factors have been similar. (139)

# OPERATING CONCEPT

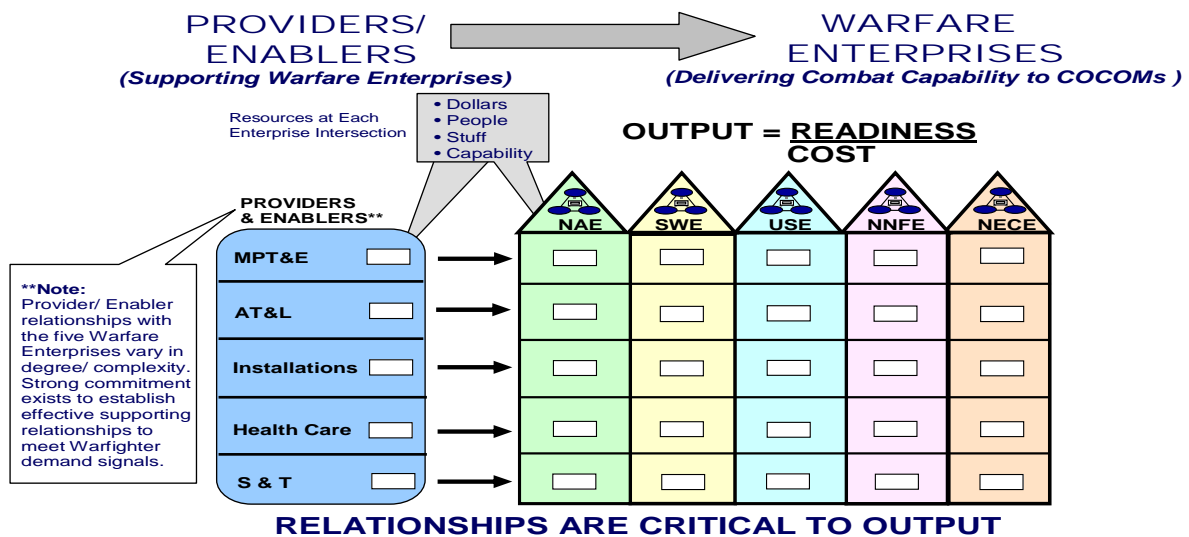


Figure 3. Current U.S. Naval Warfare Enterprise Pillar Structure. (140)

### 3. Consensus within the Department of the Navy

Consensus within the Department of the Navy regarding capability definitions seems to be achievable within each of the enterprise pillars of (141) Naval Aviation Enterprise (NAE), Surface Warfare Enterprise (SWE), Undersea Enterprise (USE), Naval Netwarfare ForceNet Enterprise (NNFE), and Naval Expeditionary Combat Enterprise (NECE), shown in Figure 4 above. This might be facilitated by the ability to overcome management barriers beneath this organizational level and also by the consolidation of each enterprise around a specific type or 'pillar' of platform/mission type area. Within the pillars it is challenging to influence information flow and consensus above the pillars (142). At the levels of responsibility above the enterprise pillar level, multiple divergent interests are managed and consensus building is still ongoing. (143)

### 4. Fragmentation and "Groupthink"

Two major problems that may occur in top management teams are fragmentation and "groupthink". (144) A fragmented team is composed of individuals pursuing their own separate goals with minimal collaboration or sharing of information. "Groupthink" is the tendency towards like-mindedness that undermines true critical analysis. The challenge is to design a process that functions between these two. (145)





in its nature, looking towards future warfighting requirements and also defining skills and assets necessary to succeed in future environments.

#### **D. PRIVATE SECTOR CONSENSUS BUILDING PRACTICES**

##### **1. Two-Phase Process and a 0-4 Year Time Horizon**

The following two-phase process appears in an article written by Marino (November 1996). Since not much literature about the public sector capability development process is available, for this thesis this process is quoted directly (152). The private sector process takes a thorough internal audit at the applications of current resources and processes utilized within an organization or firm or as a step of the capability development process. Also of significant notice is that private sector capability planning is encouraged to operate within a 0-4 year time horizon. (153)

Phase I: Identification of Core Capabilities

<u>Step</u>	<u>Objective</u>	<u>Major Question</u>
1. Prepare current Product/market profile	<ul style="list-style-type: none"> <li>- delineate the markets for each product line.</li> <li>- identify principal competitors</li> <li>- establish the contributions of each segment to division sales, earnings and asset commitments.</li> <li>- review current growth, market share and competitive position</li> </ul>	- What are we selling, to whom, and how are we doing?
2. Identify sources of Competitive advantage and disadvantage in the principle product/market segments	- identify the cost, product, and service attributes that explain the current level of performance	- Why do our customers choose our products instead of our competitors
3. Determine organizational capabilities and competencies	<ul style="list-style-type: none"> <li>- identify the physical and, knowledge assets held or controlled by the division that contribute to the competitive advantages enjoyed.</li> <li>- enumerate the organizational Skills and abilities that create the cost, product, and service competitive advantages.</li> </ul>	- What about our organization gives us cost advantage, superior quality or reliability, after-sale support or whatever it is that our customers value?
4. Sort out the core Competencies and Capabilities	<ul style="list-style-type: none"> <li>- apply tests of wide market access, tangible customer benefits, and difficult imitation to the skills identified in Step 3.</li> <li>- sort our core capabilities, i.e. those most relevant for product/market decisions</li> </ul>	- Which of our strengths and capabilities are most important for building the future of the organization?
5. Synthesize and reach consensus	<ul style="list-style-type: none"> <li>- combine, restate, challenge, and debate the results of Step 4.</li> <li>- arrive at a reduced set (generally 2-5) of core Competencies and capabilities accepted as valid by the group.</li> </ul>	- Can we agree on our organization's core capabilities?

Phase 2: Developing and Leveraging Core Capabilities

<u>Step</u>	<u>Objective</u>	<u>Major Question</u>
6. Assess future Conditions in existing Served markets	- evaluate likely changes in customer demands in the next 3-4 years. - determine the relevance of Current core capabilities to Meeting these future Requirements	- Do our skills and capabilities put us in a favorable position to serve our customers future requirements?
7. Identify emerging Markets related to Our skills	- determine likely changes in customer demands in the next 3-4 years. -determine the relevance of current core capabilities to meeting these future requirements	- What characterizes markets in which our skills provide substantial value to the customer and opportunities to earn margins that exceed our cost of capital?
8 Formulate development plans	- develop plans to meet the needs of future capabilities, asset requirements, market opportunities, and product extension opportunities	- What do we need to do to enable the organization to achieve its performance objectives?

Table 1. Identification and development of Core Capabilities (154):

## 2. Three Tasks Method for Capability Development

A different set of authors (Miller, Eisentstat, and Foote in 2002) described three required tasks for capability development that a capability configuration might utilize. The first task is to locate asymmetrical characteristics which serve as the basis of resources and capabilities and realize their potential for development. (155) The second task is the transformation of asymmetrical characteristics into core capabilities. (156) The third and final task is ongoing pursuit of opportunities in which to build upon and leverage capabilities. (157)

### a. *Task 1: Find Asymmetrical Characteristics and Their Potential for Development (158)*

To do well, organizations must develop resources or capabilities that cannot be imitated by rivals. It is challenging to develop these without an understanding of potential value or increasing return through implementation. The first step is finding characteristics that create an increasing return. In most cases, asymmetrical characteristics are good starting points for creating advantage since they should not be

able to be easily copied by competition. (159) These differences often develop due to interrelations of distinctions and skills that have developed over a prolonged period of time. (160) Sometimes these differences may be concealed, since they are retained as tacit knowledge within a firm and thus their connection to success may not be evident. (161)

Due to the hidden nature of asymmetrical characteristics, the search for them should be highly thorough and detailed across the entire scope of an organization. (162) This task should lead to understanding how an organization is different from its rivals in its execution procedures, assets, and the combinations of employment of them. An understanding of how asymmetrical characteristics can be employed to create resources and or capabilities that will generate advantages should be attained. (163)

One method to locate and identify internal asymmetrical characteristics is to identify external ones which may be more obvious. Leaders should look at what kind of opportunities they can capture that their competitors are unable to. These characteristics can also be identified though asking why an organization is better than its rivals in capturing a particular set of clients or a market. These answers may be located in an organization's operational reach, reputation, or particular expertise. (164)

Experimentation may also help in identifying these characteristics. Experimentation such as launching several entrepreneurial initiatives, seeing which ones show promise, and then trying to determine why these particular initiatives were successful over other ones may lead to a clearer understanding of asymmetrical characteristics. Such experimentation may also lead to an understanding of emerging characteristics as well. (165)

Searching internally must also be conducted in order to obtain a complete picture of all useful asymmetrical characteristics. Sometimes these characteristics may reside deep inside an organization and will have to be traced back from surface abilities. (166) Two cases are directly quoted out of Miller, Eisentstat, and Foote (2002) to provide examples of how two firms discovered asymmetrical characteristics that lead to a core capability. These cases are again quoted directly:

### **Case of Willamette Incorporated**

Willamette Inc. is a successful medium-sized paper manufacturer. One of Willamette's apparent strengths was its ability to track the paper market by making the right grade of paper at the right time. However, the knowledge of what paper to make is widely available—many competitors have it. The more basic capability is an ability to convert production processes quickly and cheaply enough to take advantage of industry price changes. The reason Willamette could do this was because of its flexible equipment. The reason it had such equipment when its competitors did not was because of the experience Willamette's engineers had built up over the years converting the dilapidated plants of rivals into some of the most flexible and efficient factories in the industry. Willamette's fundamental asymmetry and its primary source of advantage was its state-of-the-art-plant conversion and operating capabilities-capabilities, it turned out, that usually could not be duplicated by the nation's top engineering consultants. It was this profound recognition of capabilities that then allowed Willamette to allocate the human and financial resources and gear its hiring, training, promotion, and compensation approaches to support them. (167)

### **Case of Citigroup's global relationship banking unit**

The case of Citigroup's global relationship banking unit was instructive because of its crucial asymmetry-unrivalled geographic presence-for many years represented as much a liability as an asset. By 1980, Citi had developed a system of banks in 100 countries. Its nearest rival, Hong Kong's Shanghai Bank Corp, had offices in 40 countries. However, many of Citi's banks were weak, and margins were being squeezed in developed countries by competing local banks with better ties to customers and government. Meanwhile in developing countries, market volatility and political instability were real and costly hazards. Despite these problems, then CEO John Reed realized that the international network could potentially put it in a unique position to do business with far-flung multinationals that desired further globalization. Also, it was unlikely that rivals could easily imitate this resource. (168)

Therefore, identifying asymmetrical characteristics may have at least two forms. The first such as the case of Willamette, requires managers to be able to recognize emerging characteristics that may lie in intangible assets such as expertise, routines, reputation, and relationships. These emerging aspects when discovered can refocus an organization so that these characteristics are better developed. The second such as the

case with Citigroup, is the re-framing insight, which is identifying already existing but unexploited assets, (169) which once realized can be accessed and exploited.

***b. Task 2: Capability Configurations Creation by Design(170)***

Asymmetrical characteristics develop into core capabilities mainly through the design and functions of the organization. The actions of the organization will build and support capabilities by grounding them within the organization. (171) These actions do not happen in a vacuum, rather management and leadership along with the design of the organization play a vital role. (172). Well-managed capabilities will increase the performance of an organization. The objective of capability configurations is to manage and create a cycle of continuous improvement of capability enhancement that serves to identify asymmetrical traits and shape them into new or towards existing capabilities (173).

The Department of Defense directs the development of Capability Roadmaps to build or create capabilities. Mapping serves the function of allowing synchronization of determined capabilities as they relate to warfighting outcomes, architecture or infrastructure, modeling and simulation or experimentation, product evolution and modernization plans. This planning is being undertaken at the enterprise level (174). A capability roadmap is defined as the following:

A Capability Roadmap is a living document with a detailed depiction, over time, of existing, planned, and desired capabilities across the DOTMLPF spectrum, derived from joint concepts. Capability roadmaps address policy, operational concepts, architectures, programmatic with specific milestones, net-centric underpinnings, advanced technology, experimentation, and system-of system test and assessment, and will be used to inform decision makers when considering investment decisions, capability determinations, and priorities. (175)

***c. Task 3: Pursue Opportunities That Build on and Leverage Capabilities (176)***

Deeply ingrained capabilities and organizational configurations are of little value unless they are achieving positive returns. They must fit the needs of a large

audience to be effective. (177) The greater the amount of situations a capability can succeed in, the greater its value. (178) Applying capabilities to multiple situations is an ongoing process.

Private sector firms are encouraged to prioritize their most significant capabilities. What becomes defined as core-capabilities should receive the largest volume of resources. If resources are scarce enough, this methodology may impact or hurt other areas, when this is the case it should be documented as a justification for the underachievement of a secondary capability. (179)

Capabilities are constantly changing in their relevance and value. Continuous research, undertaken by a capability configuration, towards which core-capabilities are needed in the future and what characteristics and resources will be used to support them is essential. (180) This aspect makes the process of continuously managing and shaping capabilities vital. (181) Knowledge sharing benefits this process since the expertise developed in one capability may be applicable to other capabilities and situations. (182) The following table from Miller, Eisentstat, and Foote (2002) shows the relationship between design and capabilities:

<u>Design Enablers</u>	<u>Leadership Governance</u>	<u>Values and Culture</u>	<u>Structural Mechanisms</u>	<u>Systems and Policies</u>
<i>Embedding Capabilities Within the Organization</i>	<i>Leaders create context to prioritize, fund and build strategy around Capabilities.</i>	<i>Corporate culture celebrates capabilities and accords prestige to units and people most central to creating those capabilities</i>	<i>Capability-based units such as task forces and cross-functional Small Business Unit (SBU) teams are established to create and share knowledge</i>	<i>Information and planning systems target and track capabilities by unit product, and so on versus competitors</i>
	<i>Top Management Team (TMT) ensures Synergy among resources and capabilities</i>	<i>Collaborative culture to bring together front and back units</i>	<i>Multi-SBU, multifunction coordination committees build and adapt capabilities</i>	<i>Human Resource (HR) systems select, reward and promote based on capabilities</i>
	<i>TMT establishes Policies to bring Front and back units together to develop and adapt capabilities</i>	<i>Emphasis is on knowledge building and knowledge sharing among units</i>	<i>High-level management committees oversee long-term development of a specific capability</i>	<i>Knowledge systems codify proprietary information on technologies, customers, and so on</i>
<u>Design Enablers</u>	<u>Leadership Governance</u>	<u>Values and Culture</u>	<u>Structural Mechanisms</u>	<u>Systems and Policies</u>
<i>Enhancing Capabilities</i>	<i>Governance bodies describe a trajectory For core capability extension and leveraging</i>	<i>Informal networks bring front and back units and people together to develop capabilities.</i>	<i>Multi-unit teams and strategic alliance build knowledge</i>	<i>Information systems feed learning efforts; e.g., report results according to segments and customers</i>
			<i>Communities of practice grow capabilities</i>	<i>Training programs</i>
<u>Design Enablers</u>	<u>Leadership Governance</u>	<u>Values and Culture</u>	<u>Structural Mechanisms</u>	<u>Systems and Policies</u>
<i>Shaping Capabilities To Market Opportunities</i>	<i>Leaders link capabilities to target markets and define policy Parameters for identification and sequencing of opportunities</i>	<i>Entrepreneurial culture encourages managers to identify opportunities that exploit capabilities</i>	<i>Opportunity-based units help shape capabilities to market segments</i>	<i>HR, planning, and incentive systems create resources that can be easily leveraged across opportunities</i>
				<i>Rewards based on firm-wide objectives to get front and back to collaborate</i>

Table 2. How Designs build and Exploit Capability (183).



## **E. OTHER PRIVATE SECTOR CAPABILITY DEFINITIONS**

Previous attempts in defining capabilities can be classified into three categories. All categories assume that the use of tangible and intangible assets is the source of a firm's prolonged success. (184) The first are those that reflect the ability of a firm to perform basic functional activities such as distribution logistics and plant layout, and marketing campaigns more efficiently than its competition. (185) The second definition of capabilities describes the ability of a firm to improve upon its activities, which is a firm's ability to adapt, learn, and change. The third set of definitions relates to insight or the ability to recognize the value of certain resources and/or develop new strategies before their competitors do. (186) These three categories of capabilities describe the ability of a firm to perform an activity more efficiently than its competitors whether it is static, dynamic, or creative function. (187)

## **F. PURPOSE OF THE NAVAL CAPABILITY DEVELOPMENT PROCESS**

In the Department of the Navy (DON), the Naval Capability Development Process was recently adopted. It has been utilized within the airframe enterprise community at least since 2003, (188) and was recently implemented in the networks enterprise community. (189) Each of these enterprises has a team of personnel who are assigned the tasks, which are very much related to the role of a capability configuration, of aligning resources and decision making towards capabilities. The purpose of this team is to make top-level decisions for the enterprise, (190) where being at the top level provides the leadership governance required to embed capabilities within an enterprise. Often this decision making involves budgetary or programming decisions.

Although these capability configurations have existed for a relatively short time at the enterprise level, both appear to be successful at creating a capability planning process that fits the unique characteristics of their organization. (191) Furthermore, both of these capability configurations state that the decision-making process in which they are involved is continuously being developed, refined and changed. (192)

## **G. CHAPTER SUMMARY AND CONCLUSIONS**

According to additional academic literature on the subject matter; there may exist an infinite variety of capabilities, which probably makes it impossible to list mutually exclusive and exhaustive types. Since it is likely to be impossible to list specific types of

capabilities, all categories can be defined as socially complex routines that determine how effectively a firm can transform inputs into outputs. (193) This perspective has two significant elements. First is that capabilities are embedded in the routines that are the product of the total organizational structure of an organization. (194) Capabilities are located inside the corporate culture, the network of employee relations, and as manifestations of the observable structures. (195) The second element is that capabilities function as an organizational complement to efficient practices, whereas better capabilities will allow a firm to be more efficient or effectively choose and implement methods to deliver service or perform tasks. (196) These capabilities can be said to encompass two aspects, the first being the direct improvement to efficiency and the second, the ability to conceive of new ways to succeed. (197)

Pursuing the logic and understanding of capabilities will never, on its own, identify the source of sustainable competitive advantage on account of the blind assumption that this understanding will be true. The source of competitive advantage most likely is found at different places, at different times, and in different environments. Since competitive advantage is itself elusive, the practice of building organizational capabilities to sustain competitive advantage may be challenging, although some organizational capabilities may prove to be highly valuable at certain points of time. Significant evidence to support a combination and application of certain generic capabilities that achieves sustained success over a prolonged period of time has yet to emerge. (198)

Research that lists the numerous varieties of capabilities—and basic prescriptions for building capabilities that may have potential in the near future, but may be eclipsed by other capabilities as the economic environment changes—would be of value. (199) Finally, in the pursuit of sustained competitive advantage, top-level management will likely require the application and integration of multiple strategies. (200)

## **V. LIMITATIONS IN TRYING TO SOLVE MULTIPLE CAPABILITY OBJECTIVES WITH A GOAL PROGRAMMING APPROACH**

### **A. INTRODUCTION**

This chapter addresses limitations in using linear or goal programming approaches to solve multi-objective problems faced currently in the Department of the Navy regarding linking budgeting and programming towards capabilities. This thesis defines goal programming as mathematical decision models that possess assigned values to input variables in a relationship equation used to determine an output result, to be used as a tool to assist decision makers in resource allocation decisions relating to capabilities. There are several methods where goal programming is used to solve multiple objective problems. Volumes of literature are available on the topic of solving multiple objective problems with linear programming, and this chapter mentions a few.

### **B. SCARCE RESOURCES AND MULTIPLE OBJECTIVES**

In business, government, and other endeavors, scarcity of resources usually prevents achieving one set of objectives without diminishing capacity in a separate set of objectives. If this were not the case, it would be easier to achieve multiple objectives. (201) Sometimes more than one goal or objective has to be solved in a simultaneous fashion. (202) Objectives are rarely independent of each other and management decisions usually do not involve solving a single objective. Objectives are often interrelated where a decision to allocate resources to one objective influences another objective. Therefore, the decision to implement one alternative must be studied in relation to other alternatives. One school of thought calls this practice *multiple criteria decision making* (MCDM), (203)

The usage of MCDM involves making trade-offs between competing objectives. The only instance where trade-offs will not be made is where one objective outweighs or is of higher significance than all other objectives. (204) However, in reality it is difficult to distinguish or reach consensus on which objectives are more significant than others.

### **1. Benchmarking Against the Status Quo**

A possible way to benchmark MCDM is to benchmark all objectives against the status quo, (205) that is, in a simplified form with all things being equal; in order to achieve any level of success the outcome must be better than the status quo, while anything less than the status quo would be considered a failure. Here the status quo is defined as the result of not making any adjustments or taking any action at all. (206)

### **2. Pareto Optimal Decision Sets**

When making decisions about the future, separate objectives may not be readily identifiable as being better or preferable over a different set of objectives. When this is the case, a decision may be made against a "*Pareto optimal set*," (207) where the decision to move resources towards one objective will significantly diminish the ability to achieve a different but seemingly equally significant objective. A policy maker may have to choose between the status quo or an action that will make some individuals better off and make others worse off. (208) There are several methods to facilitate making resource allocation decisions by the policy maker; often the quality and availability of information has a great influence on this process. (209)

## **C. GOAL PROGRAMMING LIMITATIONS**

Linear or goal programming is limited in its potential application, and these limitations should be considered when utilizing a goal programming approach as a tool. (210) In order to be purposeful, the following are some of the limitations that may need to be overcome when choosing to implement linear-programming as a decision-making tool. First, the user must have a commanding knowledge of the relationships between inputs and outputs. (211) That would mean having perfect or near-perfect visibility of a process through its beginning, middle, and final stages. Second, the relationships between the variables must not be in a state of flux, but be steady enough for the model once developed to be useful for a measurable amount of time. (212) Third, the problem should be programmable. For example, there are increasing complexities in developing models when the multiple objectives have interrelationships between themselves rather than multiple goals that are inherently independent of each other. Lastly are the real

challenges in quantifying actual relationships between items such as raw materials, processes, and selection preferences, which are sometimes political, into useful variables or equations. (213)

### **1. Lack of Indivisibility of Inputs**

Goal programming is further limited since it does not account for indivisibility of inputs such as results that show a fraction or decimal answer when applied to a quantity of end items to be bought or produced, which must be done in whole and complete units. (214) When this is the case then the decision variable needs to be restricted to integer outputs instead of decimals. However, by adding this restriction it may diminish the degree of optimization produced by the programming model. (215) When seeking whole number solutions the most logical method is to utilize an Integer Programming methodology which provides whole number outputs. (216)

### **2. Requirements of Commanding Knowledge**

Goal Programming can be highly useful when the decision maker is “in command of the system” described within the function. That is a thorough understanding of target aspiration levels, values, and priorities are possessed by the decision-maker and also the writer of the programming function. (217) Goal programming is also a useful tool when applied to reducing computational steps required for large functions when compared to other methods. (218)

### **3. Challenges in Defining All Possible Solutions**

In its most basic form, linear programming has a single objective function that can be minimized or maximized while being subject to certain linear constraints. While in multiple objective programming there is more than one objective function that can be either maximized or minimized. Typically in multiple objective programming there rarely exists a solution which will simultaneously optimize every objective. (219)

In a multiple objective model the process of finding a solution is to find a group of non-dominated or efficient solutions. A dominated solution exists where one solution will be dominated or dependent on the outcomes of another solution, that is the solution for a first objective is not able to occur without a solution for the second. (220) Non-

dominated solutions are not dependent on the outcomes of other solutions. It is feasible that the amount of non-dominated solutions may be so large that it is impractical to analyze all of them. (221)

#### **D. LEXICOGRAPHIC MINIMUM PROGRAMMING**

One method utilized in linear or goal programming, in overcoming the challenges in clarifying efficient solutions, is to set target aspiration levels that correspond to acceptable achievement levels for each specific objective. This is done to reduce the instances of efficient solutions that would result from all goals or objectives being of equal value. In this methodology each and every goal is ranked in priority order. This means that the first goal is solved as close as possible, and then the second goal is solved as close as possible, and so on. A solution that fits this model is called a lexicographical minimum. (222) In order for this model to work, a primary objective must be selected and specific aspiration levels must be set for each objective. (223)

##### **1. Flaws of the Lexicographic Minimum Approach**

A flaw with the lexicographic minimum approach may be accepting a satisfactory solution as long as target levels are achieved, (224) while even greater optimization is feasible for more than one objective. Therefore, in this case it would be more logical to try to optimize as many objectives as possible beyond the threshold of the acceptable criteria; if this is not the case then the fallback position would be to accept an outcome that at minimum satisfies the specified target levels.

A lexicographic minimum formula prioritizes the primary objective over the following objectives so that none of the subordinate objectives are calculated until the primary objective is maximized. (225) In an optimization model all of the goals are considered simultaneously, where the primary objective will have a higher weight than follow-on objectives, but the simultaneous consideration of all possible outcomes with weights included may lead to higher overall returns than those which would be limited by optimizing the first priority first then moving down the line. (226)

##### **2. Comparison of Archimedean to Lexicographic Weights**

In Lexicographic goal programming the decision maker is required to specify his or her preference of the relative importance of multiple goals. For example, one goal would have a weighted value of 50 and another goal would have a weighted value of 30.

(227) Whereas in an Archimedean weighted version of goal-programming the decision maker quantifies a preference for all possible results of the goals but without specifying exact weight specifications for each goal, rather only which goal is more significant than the other goal but not by what degree or relationship between them. (228) However, an improper use of the weighting scheme may do more harm than good making the lexicographical solution set a better option. Free-play of objective selection without clearly specifying relationships may lead to disastrous outcomes. (229) It has been observed that the lexicographic or weight selection by the decision maker may be better even when preferences are hard to define, since the premise of the lexicographic order is that one goal has higher priority than another goal only by the most important criteria for which the two goals are different. (230)

A criticism of lexicographical goal ranking is that ranking the goals prevents tradeoff gains that could be realized otherwise. An alternative is to allow for greater free-play between goals to make some of the higher priority goals more Archimedean in nature, such that an optimal range on the utility frontier is available though the competition of the highest priority goals. (231) On the other hand, as pointed out above, too much free play can lead to disastrous outcomes. However, even if the risk of allowing free play of too many objectives is not considerable; critics of this form of programming state that the tradeoff gains are quite marginal. (232) Finally, in lexicographic programming, even if proper weights are selected, which is a must for an efficient solution to be produced, it is only valid or seen as correct after implementing sequential steps with proper feedback to the decision maker, (233) or ex poste.

#### **E. FLAWS OF SOLVING PRIORITY SELECTION WITH PROGRAMMING**

Further applications of goal programming can be used to solve to solve for prioritization problems when presented with multiple objective problems. This is referred to as the Logarithmic Goal Programming Method. (234) This is not the only form of goal programming that performs this function of selecting priorities; other methods which may be far superior to this are the Eigenvector Method and the Logarithmic Least Squares Method. (235) Both of these methods illustrate the decision maker's lack of clearly defined goal preference prior to making the decision. (236) Each of these two methods has advantages in some problem forms and disadvantages in others. Therefore, if able to

implement a goal programming method that can prioritize objectives based upon the inputs provided and used, then a choice of methodology should be made when approaching the endeavor to select priorities due to the comparative strengths and weaknesses between available methods. (237)

#### **F. ECONOMIC USEFULNESS OF A GOAL PROGRAMMING APPROACH**

The Navy in its current budget framework has divided its structure into the five warfare enterprises. The combination of each of these enterprises defines what the Navy does. (238) Currently the definition of how all of these warfare enterprises are being aligned towards the Navy's objectives and those of recently promulgated Joint Capabilities is occurring. (239) Also at this time, the Joint Capabilities are still being defined and have not been firmly established. Also, the current definitions of Joint Capabilities leave room for ambiguity in interpretation. (240) Furthermore, even if capabilities were more clearly defined, it might prove to be challenging to program the interrelationships between multiple capabilities while concurrently defining a methodology to translate user functional needs statements into a number used in an effective capability programming model. (241)

It is extremely hard to maintain an economic consistency within goal programming. This is because the value of each objective or goal to the decision maker is typically in a state of flux. (242) Generally the dynamic and uncertain aspects of the real-world are impossible to quantify in a goal-programming model and this endeavor becomes more or less a theoretical goal. (243) The optimization of multiple goals may only exist in our imagination since in most cases it is not feasible for a decision maker to make improvements towards one objective without sacrificing the benefit from another objective. (244)

#### **G. CHAPTER CONCLUSION AND SUMMARY**

A positive aspect of goal programming is that it accounts for the cognitive nature of problem solving. However, since this is done by human beings, it may not be entirely rational or omniscient. Therefore, a difference between a satisfactory solution and that of an optimal solution may not be all that different. (245) Goal programming in its formulation relies on user input, the nature of the problem at hand, and is behaviorally grounded. Over reliance on goal programming may lead to misuse if applied incorrectly.



If a decision maker does an ineffective job in setting weight values and or sets unreasonable target values then the solution will not produce an effective solution. (246)

In closing, linear or goal programming is limited with its applications, (247) and these limitations should be considered when utilizing a goal programming approach as a tool in the endeavor to solve a multiple objective problem. (248) First, the user must have a commanding knowledge of the relationships between inputs and outputs. (249) That would mean having perfect or near-perfect visibility of a process through its beginning, middle and final stages. Second, the relationships between the variables must not be in a state of flux. (250) Third, the problem should be programmable where it is possible to define all of the relationships between the inputs and outputs. (251)

Although it may not be practical to implement goal programming as a solution tool in all problem-solving efforts, it will always be practical to seek perfect information. (252) The pursuit of quantifying the relationships in a process and clarifying objectives is valuable whether or not goal programming is utilized.

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## **VI. OBJECTIVE PRIORITIZATION AND OPTIMIZATION OF INFORMATION EXCHANGE**

### **A. INTRODUCTION**

This chapter focuses on the preference for policy makers to make priority choices regarding capabilities over any other means. It explains the dangers of allowing participants in any resource allocation system to operate with minimal information. Allowing and enabling the maximum amount of information efficiency to a resource allocation process will provide the most positive influence or direction towards the final outcome.

A great deal of literature is available on the subject of challenges in allocating resources within firms consisting of different departments with different objectives. (253) Often varying degrees of information flow and the broad range of differing preferences are not considered. (254) The task of allocating resources is complicated by differential information and divergent, competing goals between the various departments and their headquarters. (255) Typically, division managers possess greater levels of knowledge about their departments than does the headquarters element. (256)

### **B. POSITIONING OF EXPERTISE AND KNOWLEDGE**

The question of how an entire organization is to allocate valuable resources among subordinate division is complicated by the fact that division managers usually have the most accurate knowledge of their division. (257) When division managers are only knowledgeable of their division and know little else about the rest of the organization, they will sometimes inflate or misstate their information submitted to corporate headquarters in an effort to retain resources within their division. (258) This distortion of priorities may be further worsened by an institutional rewards system, which benefits managers who succeed in garnering more resources during interactions between the division and the corporate headquarters. (259) A potential solution to this dilemma may be to have the firm's departments come to congruence among themselves with headquarters not playing an active role except for establishing the parameters within which decisions must be made. (260)

### **1. Corporate Headquarters with Perfect Knowledge**

If corporate headquarters did possess total and complete knowledge of the nature and interactions of each department there would be no need for any interaction with any of the departments. In this case, headquarters would select the optimal solution for the entire firm. Then all subordinate departments who would have little grounds to argue against this optimal solution. (261) However, when knowledge is held by division managers, the ability of headquarters to derive an optimal solution in a knowledge vacuum becomes more challenging. (262)

### **2. Unrestricted Autonomous Divisions**

Autonomous divisions, if left unrestricted, may try to maximize their separate profits, which may prove counter to the interests of the organization as a whole. (263) Divisional autonomy, however, is challenged by the interdependence between divisions for usage of scarce resources. (264) When this is the case, the problem of interdependence of scarce resources between departments is solved and divisional autonomy is retained to the largest degree when the combined divisional marginal revenues become the marginal revenue for the organization as a whole. (265) In attempting to make a combined effort towards allocation of resources, each division is expected to provide a correct and truthful application of their information. (266)

### **3. Feasibility of Perfect Knowledge**

Much of the research on allocation of resources in the public sector is geared towards Pareto optimal solution sets, which maximize utility on the production possibility frontier. In the pursuit of Pareto optimal solution sets perfect knowledge of all of the independent inputs is a key requirement. (267) However, virtually all public sector enterprises operate in economic environments where achieving perfect knowledge is a practical impossibility. (268)

## **C. ECONOMIC ENVIRONMENTS**

An economic environment may consist of participants and stakeholders in the process, the resources present, and the means, availability, and ability to exchange information between participants and stakeholders. (269) Each economic environment will possess a resource allocation mechanism, where it may be possible to define or control the scheme of resource allocation to the principle participants and stakeholders.

(270) Once a resource allocation mechanism is defined, it carries with it a large potential to influence the behavior of the participants of the process. (271)

### **1. Strategy Selection by Participants**

The strategy selected by each participant with respect to which information to broadcast to other participants and stakeholders will also be influenced by the amount of information already observed and received. (272) Past and present information received, relative position within a resource allocation process, and results of past decisions will also have value. A participant may even go so far as to anticipate the future signals and actions of other participants even though the participant may not have any visibility over the functions of others. (273) In the end it is the ultimate combination of all information exchanged that shapes the final outcome of a process. (274)

### **2. Information Visibility and Strategic Choice**

Selection of strategy by the decision makers in a game is more than likely to be different when information is incomplete than when information is complete. (275) The reason for this change is that a participant in a game with perfect knowledge would select a strategy based on what that participant observes about others in the game. However in the case of a game with incomplete information a participant selects their strategy based on what they think other players will do with limited or no visibility of the other player's functions. The purpose of all strategies in all scenarios whether having perfect or imperfect knowledge is to achieve a positive or acceptable outcome for the participant involved. (276)

A game with complete information has greater potential for an outcome of shared mutual benefit that satisfies the strategies of all parties involved. (277) In a situational game with incomplete information each participant will select a strategy that is aimed at maximizing their expected payoff based on the limited information that can be observed about the other participants. (278) One enterprise has created a common – analytical framework to assist in the information exchange for all the participants and stakeholders involved in their capability resource allocation process. (279)

## **D. DEFINING ORGANIZATIONAL GOALS**

In establishing organizational goals organizational behavior scholars state that there are six required conditions as follows—quoted from McShane, VonGlinow (2005).

1. *Goals must be specific*
2. *Goals need to be relevant to jobs and functions of an organization*
3. *Goals need to be challenging*
4. *Goals need to be achievable in order to sustain employee commitment*
5. *Participation by employees may be more beneficial*
6. *Feedback to determine if goal(s) have been achieved or underachieved. (280)*

### **1. Purpose of Feedback**

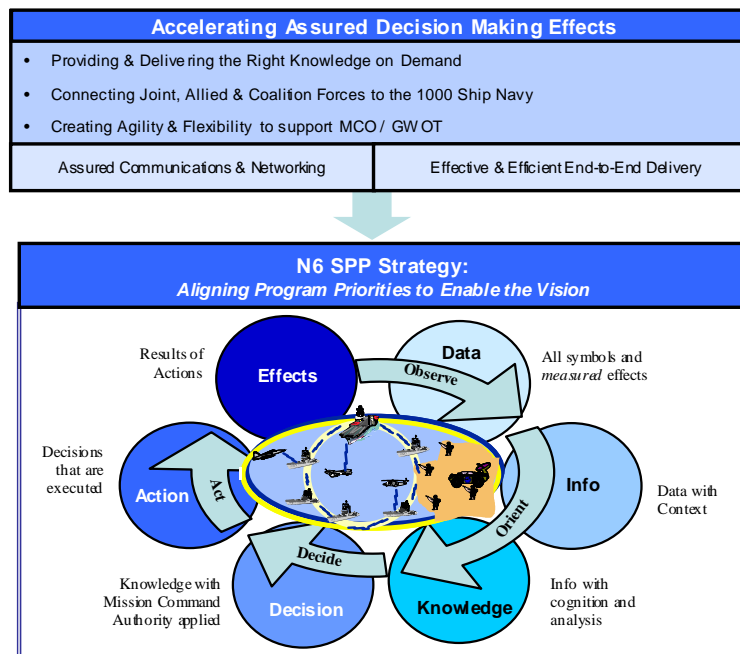
Of those six characteristics, this thesis will focus on the role of feedback in goal establishment. Without feedback, it is not possible to provide information to correct performance shortfalls. (281) Communication enables coordination, knowledge and transmission of managerial decisions. (282) Feedback is an essential part of organizational communication, but is effective only if feedback messages are received and acted on. (283)

Within organizations workers possess varying beliefs that their efforts will result in achieving a particular level of performance. (284) In some situations, employees may feel that even the highest level of effort will not result in the performance level demanded of them. (285) In order to improve this perception a strategy of clearly communicating tasks and matching resources to these tasks is often necessary. (286)

Goals are the primary and ultimate objectives that employees within an organization are trying to accomplish through their efforts. (287) Feedback systems are a mechanism that is used to see how well an organization is moving towards its objectives. Measuring and quantifying feedback is an essential part of quantifying the implementation of an action, goal, or purpose. (288) Objectives and goals in an organization need to be stable and may need continuous reinforcement. (289)



# N6 POM-08 Vision



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Figure 5. CNO N6 SPPV2 slides provided by enterprise 5 August 2006, (290) which illustrates Results of Actions or feedback as part of its capability allocation strategy.

## 2. Significant Enough Time Period to Build Reference

Beliefs in the capacity of an organization to achieve results often requires the continued measurement over a long-enough period of time and the continued reference back to earlier success to reinforce current objectives. (291) This effort may require a trial and error process where, in the short term, assumptions about how to accomplish the objective and the desired level of achievement of the objective may prove elusive. Some objectives may require a trial and error period over long enough duration in order for the desired level and means to achieve the objective surface. (292)

## 3. Emergence of Useful Metrics Over Enough Time

Furthermore, in attempting to achieve a newly defined objective, weights, priorities or a means to measure the inputs and outputs of the process (i.e., metrics) will need to be established. In doing so, it may prove that theses initial weights, measurements, or priorities themselves may prove erroneous. But without the effort to

establish initial weights and measures the eventual development of the true weights and measures and eventual success will not occur. (293) Therefore, not just the goals themselves are important, but the lasting and ongoing process of reinforcing them, even in the face of underachievement, is also highly significant. (294)

#### **E. RELEVANCE TO DON PROGRAMMING AND BUDGETING**

Recently, DoD initiated concurrent Program and Budget review. This change was made in 2001, meaning that it would be implemented in 2002. Prior to this change, the POM was submitted for review in May and then the budgets that were based off of the POM would be built. Now both are due in late August. (295) Coordination has become less difficult because of this change, but it has not removed all barriers. This reduction in coordination barriers was the result of shifting the dependencies of information flow between departments in this process. (296) Shift dependencies occurred because of the emergence of a new strategy that necessitated a different of method of information exchange among all participants (297)

##### **1. Relationship Interdependencies**

McCaffery and Jones (2004) mention ( 298 ) that three types of task interdependence are described by Nadler and Tushman (1988) as pooled interdependence, sequential interdependence, and reciprocal interdependence. ( 299 ) Pooled interdependence is when almost unrelated and practically independent entities that still remain part of a larger parent organization have to share the same resources. The dependence on the same source of resources is what pulls these organizations together. This type of interdependence has the lowest apparent coordination and linking requirements. ( 300 ) Sequential interdependence possesses a higher amount of coordination and linking requirements than pooled interdependence. This is because of the nature of the work-flow between units. In the case of sequential interdependence, one unit has to depend on the work being completed by a unit ahead of it. Work units involved in this type of interdependence are required to closely coordinate timing of work completions by a lead unit so the follow-on unit will start its work in the timeliest most efficient fashion. (301) Reciprocal interdependence means that different work units must work concurrently to make a common product. This imposes even more coordination and linking efforts since no single unit can complete its product without the inputs from



other work-units. Reciprocal interdependence requires the most intense coordination effort of all types and generates the highest degree of relationship complexity between work-units. (302)

## **2. Sequential Interdependence Prior to 2002**

Prior to this change, the 2001 change to the Program and Budget review process reflected sequential interdependence. After the change, the process took the form of reciprocal interdependence. (303) In the case of DoD, when the process had sequential interdependence, it was perceived as being less efficient. The shift in methodology in effect forced various departments inside DoD to increase their coordination since they were now required to do so. This is evident in that after the reform cuts would be made to both the POM and Budget Submission, than prior to the reform where cuts would be made to the Budget Submissions only. (304) Criticisms of the pre-2002 systems are stated by McCaffery and Jones (2004) as the following:

1. Inadequate guidance: it felt the Defense Planning Guidance issues by SECDEF to initiate the POM process, which lead to decisions about what to fund for the budget year was often late and unaffordable and did not provide a clear statement of SECDEF priorities.
2. Concurrent process flaws: program and budget processes appeared concurrent but not well coordinated.
3. Continuous rework: the POM and budget were subject to disassembly, rebuilding and review each year.
4. False precision: programming for the acquisition process required excessive detail and was projected too far into the future.
5. Revisiting decisions: decisions made during one cycle were not always recognized and respected in the next.
6. Changing rules: rules expectations, and metrics complied with in advance by the Navy were changed later in the process to facilitate cuts.(305)

## **3. Effects of 2003 Two-Year Cycle Reform**

In 2003, PPBES was reformed into a two-year cycle from a one-year cycle. Post budget reform means that base budgets are enacted for a two-year cycle. (306) This reform meant that instead of each year having a major review there would be a significant

review every-two years, these are known as the on-years. The years without significant reviews are known as off-years. In the off-years only minor changes are to be enacted. (307) According to McCaffery and Jones (2004), the PPBES system was driven by incremental decisions. (308) This was likely the case with the process so highly fragmented, mandating the 2001 reform to force coordination upon the participants. If any of this incremental behavior carries beyond the 2003 reform of the two-year process then the results of decisions now last for two years instead of a single year. (309)

McCaffery and Jones (2004) state that with the two-year cycle the stakes of putting together the POM and Budget Estimation Submission (BES) are higher on account of results lasting two years. (310) The usage of the word "stakes" implies the existence of gambling as part of this process. If it is true that gambling of, or gaming of, submissions is part of this process, then it is highly likely that asymmetrical information flow, meaning barriers to information exchange, exists in today's system.

#### **4. Comments by Budget Process Participants in 2006**

Participants in this process have commented that the time allocated for making budget decisions decreases as the due date for submitting final information draws closer. In fact, as the due date for submitting final information gets closer, the amount of change requests imposed upon them increases and the time allocated to make these decisions decreases. (311) In this process, these participants do their utmost best to present clear and unbiased information (312), however, there is not enough time to perform as thorough of an analysis as desired towards the end of a cycle. (313) In addition to this, there are multiple external stakeholders in the affairs of these participants, all of whom possess separate agendas that need to be considered when making budgetary or programming choices. (314)

#### **F. CHAPTER CONCLUSIONS AND SUMMARY**

It is conceivable that the coordination demands placed upon budgetary participants has become less complex due to the 2001 reform which forced participants to coordinate with one-another. However, this process is still not without its flaws, due to the insufficient time allocated to make final last-minute decisions. (315) If both McCaffery and Jones (2004) and Arthur (1988) are correct, then the incremental behaviors of the pre-2002 system (316) are likely to still exist within this entire process

because of the lock-in effect (317) of a successful type of practice within an organization. Incremental decisions are made by uninformed decision makers (318), and if they are performed by well-meaning uninformed decision makers, then these will take the form of best guesses. (319)

### **1. Prioritize Objectives Above the Enterprise Level**

Prioritizing objectives above the enterprise level would provide a basis to which all decisions could be grounded against. It may or may not be feasible to change the nature of last-minute decisions due to the amount of stakeholders involved in the process, but the endeavor to simplify the decision process by prioritizing objectives would provide clearer information to decision makers who might be caught in a pinch. Because the current strategy creates reciprocal interdependence, this still means that relationships between the work-units in the BES and POM process are still highly complex. The pursuit of perfecting information exchange among all participants will provide better information to the decision makers who in-turn will be more likely to adopt a strategy of reaching a solution that achieves the marginal benefit of all the participants and is in the best interest of the parent organization.

### **2. Information Flow versus Politics**

This chapter described three aspects of resource allocation mechanisms that influence results and identified to whom they are relevant in the DON. The first is the quantity and quality of information provided to all the participants. The second is the rules or structure of the allocation system. The third is feedback of the relationships between inputs and outputs and the ability to quantify these relationships. The clearer each of these aspects is the easier it becomes for all participants in the resource allocation process to reach a desired outcome. The best way to achieve this is through open lines of communication and a clear set of prioritized objectives. This claim applies to DON programming and budgeting since it is apparent that barriers to information flow, whether intentionally or unintentionally created, still exist. Further, in the politics of budgeting, information transparency and open lines of communication are not always valued above other attributes, i.e., those that are used to influence resource negotiation and decision making. Budget negotiation inevitably involves some degree of strategic misrepresentation. Where this is present then a certain amount of information asymmetry

is naturally preferred by those parties who believe their goals will be enhanced through use of such strategy in the budget game. (320) Whether a greater focus on capabilities in DON and DoD resource allocation decision making will change this to any extent remains to be seen.

## **VII. ANALYSIS OF THE NAVAL CAPABILITY DEVELOPMENT PROCESS INSIDE TWO NAVAL WARFIGHTING ENTERPRISE PILLARS AND THE FYDP**

### **A. INTRODUCTION**

This chapter primarily describes enterprise capability planning in that greater clarity of objectives within the near and mid-term planning horizons would be of greater benefit to making resource allocation/budgeting and programming decisions easier and more measurable. A detailed study of the composition of an enterprise capability planning team may be of value, but since each enterprise is assumed to be an autonomous entity a thorough analysis of team composition does not seem as valuable as stating common themes observed. Recently published joint publications have addressed greater clarity for mid and near term planning. However, since this is recent publication it is a reasonable estimation that the focus of work effort in clarifying near and mid term planning has yet to emerge.

### **B. EVOLUTION OF THE NAVAL CAPABILITY DEVELOPMENT PROCESS**

The Naval Capability Development Process (NCDP) is currently evolving and is in its early stages of development. (321) Information liaisons exist between enterprises and top level management but the focus of current organizational efforts is on developing internal processes within the enterprises themselves. (322) Challenges exist in mapping capabilities that occur in more than one enterprise. (323) The goal and current end state of current capability planning efforts is to provide the most accurate information to OPNAV. (324)

The objectives of NCDP capability planning efforts in 2004 were the following: First, to align platforms and programs to capabilities in order to be able to measure a change in a capability with a change in a program. Second, is to determine where capability gaps are and then fill them. Third, to determine where there is too much capability and make necessary reductions. (325) Fourth objective, to provide for a balanced strategy that enables investment in future capabilities and maintains warfighting wholeness. (326)

## **C. DISCUSSION OF PLANNING TIME HORIZONS**

Currently it seems that capability planning efforts at the Joint level are more highly focused beyond the realm of the Future Years Defense Plan (FYDP). (327) Capabilities that can be brought into the FYDP might be of greater value to the enterprises. (328) Currently in mapping systems to capabilities no weights or values have been assigned to any platforms or systems. One enterprise made an effort to assign weights and significance to all of its platforms that it had cognizance over. Although consensus was reached for its POM submission, consensus on capability/platform ranking was not achieved.

### **1. Recent Near and Mid-Term Prioritization Challenges**

A large hurdle in this effort was trying to assign a weight to a capability that falls within multiple naval warfighting areas as defined by Sea Power 21. (329) A desire expressed in another enterprise was an improvement of the means to better define and implement changes in acquisitions, capabilities, and the POM advanced planning of JCIDS. (330) According to CJCSI 3170.01E, Glossary page GL-12 the following definition applies to joint tasks which are focused on providing a prioritized list of tasks to fall within the scope of the near and mid-term objectives of the FYDP:

Joint tasks – To ascertain joint capabilities that can immediately direct the near and mid-term objectives of the Future Years Defense Plan, joint tasks must be determined on an annual basis. The Joint Chiefs of Staff, in coordination with the Services and combatant commands, will prioritize a limited number of joint tasks (including capability prototypes) annually that are based on combatant commander input, experimentation and joint lessons learned. The joint tasks will be developed to meet the joint force objective of full spectrum dominance as informed by the Joint Operations Concepts. The joint tasks will primarily focus on joint military operations at the operational and strategic level of war and crisis resolution as informed by the Family of Joint Future Concepts. The development of these joint tasks will determine the division of Service responsibilities and permit the distillation of quick-win joint capabilities. The resulting Service responsibilities and capabilities from these joint tasks will serve to inform programming decisions and the Joint Capabilities Integration and Development System process.(331)

## **2. Status of Joint Capabilities in 2006**

A list of Joint Capabilities has been published, but this list is still evolving and there is no knowledge of any effort made to have it prioritized. (332) Currently, Joint Capability definitions themselves are ambiguous and it is hard to determine where certain functions belong. For example, tactical air support falls under both Joint Air Operations and Joint Fires under Joint Land Operations. (333)

## **3. Near and Mid Term Warfighting Solution Methodology**

According the CJCSI 3170.01B the Operation of the Joint Capabilities Integration and Development System published 11 May 2005 the following process is set forward to conduct a capabilities based assessment through four steps to come up with war-fighting solutions:

1. JCIDS Analysis. The JCIDS analysis process is a capabilities-based assessment (CBA) composed of a structured four-step methodology that defines capabilities gaps, capability needs and approaches to provide those capabilities within a specified functional or operational area. Based on national defense policy and centered on a common joint warfighting construct, the analysis initiate the development of integrated joint capabilities from a common understanding of existing joint force operations and DOTMLPF capabilities and deficiencies. While a JCIDS analysis may be initiated by any number of organizations, to include combatant commanders and FCBs, a sponsor needs to be brought into the analysis as early as possible. The term “sponsor,” as used in this document, is the DoD component, domain owner or other organization responsible for common documentation, periodic reporting and funding actions required to support the JCIDS process and acquisition activities carried out in accordance with DoD 5000.12 12 May 2003, and National Security Space Acquisition Policy 03-01, 6 October 2003, (e.g., Services, agencies, principal staff assistants). The sponsors must collaborate with the combatant commands and FCBs to ensure capabilities are defined from a joint perspective. The analysis is based on the Family of Joint Future Concepts CJCSI 3010.02 series. The resulting analysis also forms the foundation for integrated architectures that are developed to structure solutions to capability needs. The assistance and advice of appropriate FCB working groups should be solicited as early as possible during the analysis to facilitate the collaborative effort across many organizations. The sponsor-initiated JCIDS analysis provide the necessary information for the development of ICDs and joint DCRs the FCBs will provide oversight and assessment of the analysis as appropriate to ensure it is accomplish from a joint perspective.(334)

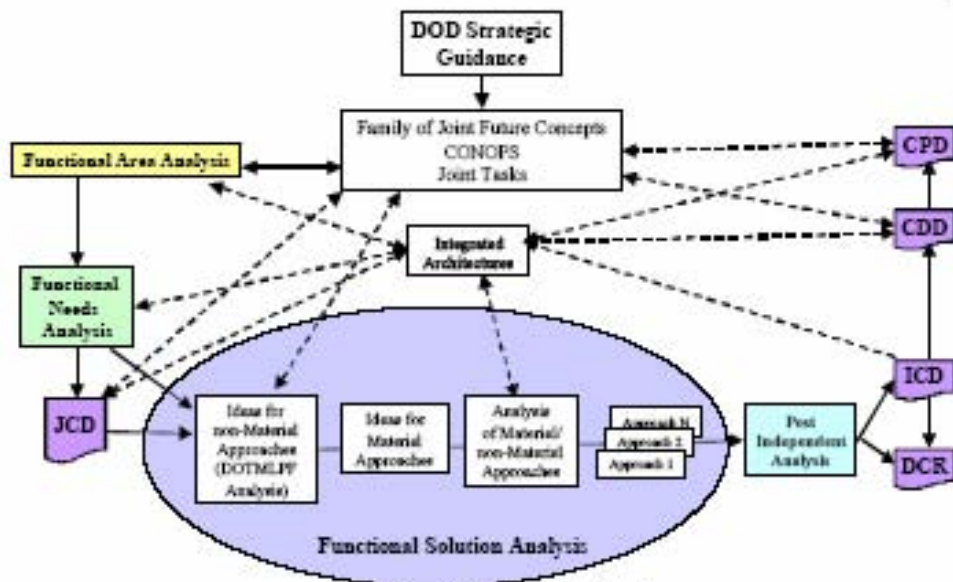


Figure A-1. JCIDS Analyses

Figure 6. JCIDS Analysis process as defined by the CJCSM 3170.01B, 11 May 2005 (335) Family of Joint Future Concepts, CONOPS, and Joint Tasks are utilized in planning.

The following information in quotations from CJCSM 3170.01B, spells out the role of different inputs utilized during the first stage of JCIDS analysis. The objective of JCIDS is to make the most thorough possible analysis prior to Milestone Decision A or prior to the commitment of large amounts of resources and labor-hours. (336) Of interest is the mention of approved concept of operations and joint tasks as part of this first step of the JCIDS analysis.

**2. Functional Area Analysis (FAA). The first step in the JCIDS analysis begins when the combatant command, FCB or sponsor leads performance of an FAA.** The FAA can be self-initiated by a sponsor or combatant command based upon an approved concept of operations (CONOPS). The FAA may also be initiated at Joint Requirements Oversight Council (JROC) direction based upon the Family of Joint Future Concepts. An FAA identifies the operational tasks, conditions and standards needed to achieve the desired outcome for the military objectives. **It uses, as input, the national strategies, the Family of Joint Future Concepts, CONOPS, joint tasks, the capabilities list (e.g., Universal Joint Task List (UJTL)), the anticipated range of broad capabilities that adversaries might employ and other sources.** (337)



#### **D. CAPABILITIES APPEAR AS LONG-TERM PLANNING ASPECTS ONLY**

Capabilities are provided for this initial analysis primarily through the Family of Joint Future Concepts. The Family of Joint Future Concepts does not however address a near and mid-term time horizon for its capabilities, but that of ten to twenty years out. (338) Therefore, when doing capability planning it appears that most information being provided towards the analysis is relevant to ten or more years into the future. Further information on the first step of the JCIDS analysis from CJCSM 3170.01B is spelled out as the following:

a. The Family of Joint Future Concepts and other sources provide a list of capabilities and associated operational conditions CJCSI 3010.02 series. The FAA identifies the scenarios against which the capabilities and attributes will be assessed. Scenario sources include, but are not limited to, the Defense Planning Scenarios (DPS) published by OSD. This capabilities list is then scoped in order to make the analysis conducted during the FAA manageable. (339)

b. The output of the FAA is the list of capabilities and their associated tasks and attributes. The tasks, conditions and standards are developed to the level required for analysis in the follow-on functional needs analysis (FNA). The capabilities will be linked to the key characteristics defined in the JOpsC. The FAA includes cross-capability and cross functional analysis in identifying operational tasks, conditions and standards and for the basis to develop integrated architectures. The FAA should be conducted as a collaborative effort with input from the combatant commands, FCBs, Services and agencies. (340)

##### **1. Some Joint Doctrine Capability Terminologies**

CJCSI 3010.02B Joint Operations Concepts Development Process defines characteristics as the following, which bears a close relationship to the definitions given for resources and asymmetrical characteristics in the previous chapter on the significance of capability configurations:

Characteristic—A desirable trait, quality or property that distinguishes how the future joint force should conduct military operations.

CJCSI 3010.02B defines attributes and capability as the following:

Attribute—A quantitative or qualitative characteristic of an element or its actions

Capability—A desirable trait, quality, or property that distinguishes how the future joint force should conduct military operations. (341)

## **2. Joint Operations Concepts Long Term Horizon**

The objective of the Joint Operations Concepts Development Process is focused on providing a list of operating scenarios beyond the FYDP 8-20 years in the future. Along with the Family of Joint Future Concepts it is to be used in the first step of JCIDS analysis. The Joint Operations Concepts Development Process is described by CJCSI 3010.02B in the following paragraphs:

The Objective of JOPsC is to guide the transformation of the joint force so that it is prepared to operate successfully 8 to 20 years in the future. These concepts are informed by top-level strategic guidance in the effort to identify future capabilities requirements. JOPsC present a detailed description of “how” future operations may be conducted and provide the conceptual basis for joint experimentation and capabilities-based assessments (CBAs). The outcomes of experimentation and CBA will underpin investment decisions leading to the development of new military capabilities beyond the Future Years Defense Program (FYDP). (342)

## **3. Functional Capabilities Board Long Term Horizon**

According to CJCSI 3137.01C The Functional Capabilities Board Process is focused 10-20 years in the future, Enclosure C the following applies:

a. The overarching JOPsC describes how the future joint force will operate 10-20 years in the future in all domains across the range of military operations within a multi-lateral environment in collaboration with interagency and multinational partners. It guides the development of future joint concepts and joint force capabilities. The JOPsC establishes the unifying framework for the family of joint concepts, the attributes and broad strategic and operational tasks for the future joint force, a campaign framework for future operations, the broad context for joint experimentation and the conceptual foundation for unified action towards implanting the military aspects of national strategy.

b. JOCs provide the operational-level description of how a joint force commander 10-20 years in the future will accomplish a strategic objective through the conduct of operations within a military campaign. This campaign links end state, objectives and desired effects necessary for success. The concept identifies broad principles and essential capabilities and provides operational context for JFC and JIC development and experimentation.

c. JFCs describe how the future joint force will perform a particular military function across the full range of military operations 10-20 years in the future. JFCs support the JOpsC and JOCs and draw operational context from them. JFCs identify required capabilities and attributes, inform JOCs and provide functional context for JIC development and joint experimentation (an example of a JFC is Battlespace Awareness). FCBs develop and maintain JFCs and assist in the development of attributes, assumptions, measures of effectiveness and standards that support JCIDS. FCBs continually assess their JFCs and relationships with other concepts.

d. JICs describe how a joint force commander 10-20 years in the future will integrate capabilities to generate effects and achieve an objective. A JIC includes an illustrative CONOPS for a specific scenario and a set of distinguishing principles applicable to a range of scenarios. JICs have the narrowest focus of all concepts and distill JOC and JFC-derived capabilities into the fundamental tasks, conditions and standards required to conduct a capabilities-based assessment (CBA). Capabilities-based assessments apply functional area analysis (FAA), to assess capability needs, gaps, overlaps and solutions to support a JIC. (343)

#### **E. THE TOP DOWN APPROACH IS FOR ALL TIME HORIZONS IN DOD**

According to CJCSI 3170.01E a Top Down Capabilities Identification Methodology is utilized to determine capabilities for both the near, mid and long term objectives of the joint force. The endeavors that are used for beyond the FYDP are not to be used for near and mid-term planning, since these require careful study and the iterative process of assessment. Meanwhile, Joint Tasks and CONOPS are to be used for near and mid-term planning. CJCSI 3170.01E states the following in Enclosure A.

b. Top Down Capabilities Identification Methodology. Joint future concepts are developed from the top-level strategic guidance, providing a top-down baseline for identifying future capabilities. The Family of Joint Future Concepts is used to underpin investment decisions leading to the development of new capabilities beyond the Five-Year Defense Plan. New capability requirements, material or non-material, must relate directly to capabilities identified through the Family of Joint Future Concepts, whose hierarchical nature and deliberate process require close examination of needed capabilities through an iterative process of assessment. **Therefore, joint future concepts are not intended to provide immediate solutions but proposed solutions that can afford careful examination over a more extended period of time. Concepts of Operations (CONOPs) and joint tasks are focused on capabilities required in the near-term (now to 7 years in the future). CONOPs and joint tasks allow the joint community to adjust or divest current capabilities by providing the operational context needed to**

**substantiate current programs.** The objective of this methodology is to answer “what do the joint war fighters value?” and “how do we measure it?” The process flow from national level and strategic guidance though the concept is shown in the Figure. (344)

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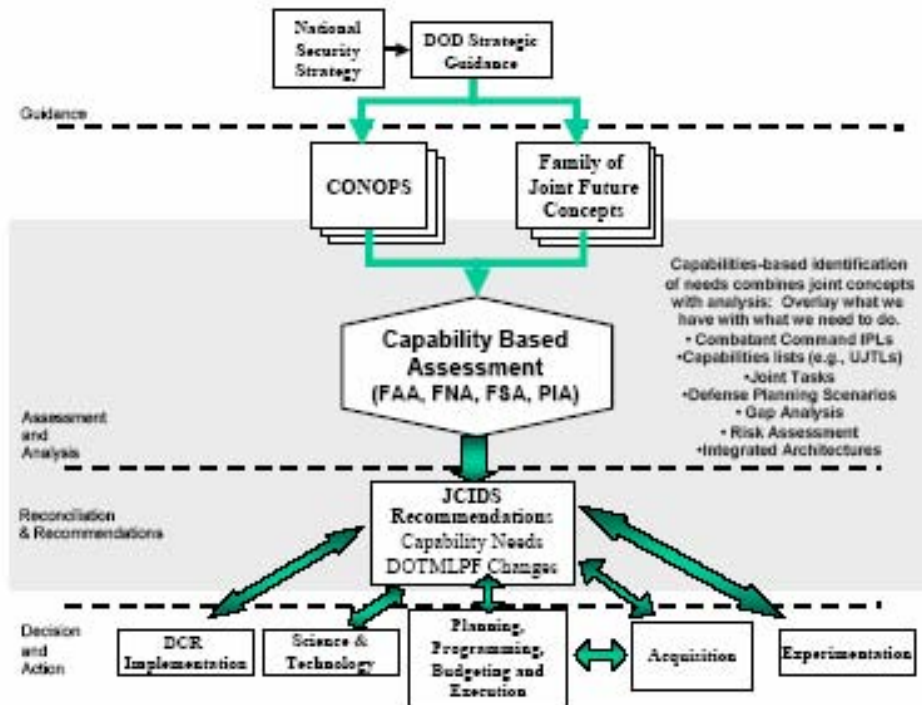


Figure A-1. Top Down Capability Need Identification Process

Figure 7. Top Down Capability Need Identification Process that demonstrates the role of joint tasks and CONOPS in capability determination inside the FYDP. (345)

## F. CURRENT IMPLEMENTATIONS OF THIS IN TWO ENTERPRISES

Currently, the Aviation warfare enterprise utilizes CONOPS in near and midterm or within FYDP capability alignment efforts. (346) CONOPS are utilized in the NNFE enterprise as inputs to their Capabilities Development Process. However, in the NNFE domain specific C4I CONOPS covering net centric operations to date are few in number. (347) Although Joint Tasks have not been seen at the enterprise level, it is perceived that the Joint Capability Areas may be a similar surrogate with the potential to be prioritized. (348) Top level budget personnel have not seen Joint Tasks published to date and

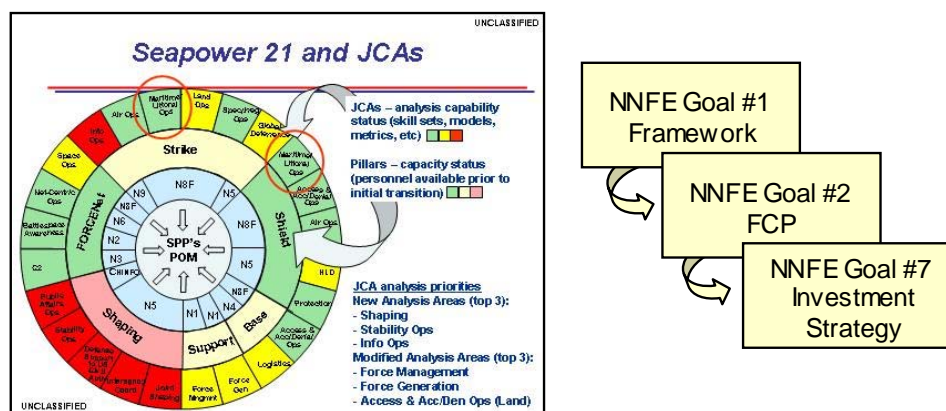
mention that the Combatant Commanders Integrated Priority Lists are another possible substitution to them. (349) However, neither the Integrated Priority Lists nor JCAs appear to be prioritized towards resource allocation decisions.



## Critical Assumption



- *OPNAV, CFFC, NNWC, SPAWAR and PEO C4I will establish a “Common Analytic Framework”*



United States Fleet Forces Operational Readiness, Effectiveness, Primacy

Figure 8. Enterprise level mapping strategy towards Sea Power 21 and Joint Capability Areas during FY2006. (350)

### 1. The Inability to Map Top-Level Objectives

Shown in Figure 9, a warfare enterprise is able to determine which of Sea Power 21 and JCAs it needs to consider as its own investment priorities. In the case of the NNFE enterprise it has chosen Shaping, Stability Operations and Information Operations as its priorities. However, above the NNFE enterprise none of the Sea Power 21 and JCAs appears to be prioritized in their significance, hence the circular depiction of capabilities above the NNFE level instead of ranking order. From this information it is challenging to determine what aspects higher authorities are going to make their priorities, while it is visible to the observer that this enterprise has chosen to focus on certain areas

with red colored capabilities being most critical, yellow next critical, and green least critical. However, weights or values of relationships regarding all capabilities at this time are not known to NNFE.

## **2. Usage of CONOPS and Varying Degrees of Success**

CONOPS can and do play a large role in near and midterm capability alignment planning in the Aviation Enterprise. (351) This is done chiefly in determining how to come up with a tactical solution to a particular threat scenario, particularly in warfighting analysis. CONOPS is a large driver in the solution sets of what to invest in towards future warfighting capabilities. (352) This analysis most likely corresponds to the eight steps described in Phases 1 and 2 of developing and leveraging core capabilities described in Table 1 in Chapter IV. Joint tasks have only been recently promulgated and do not appear in CJCSI or CJCSM instructions prior to 11 May 2005. (353) Therefore, due to the current focus of effort in establishing the capability resource allocation mechanism, it is likely that the work of defining the joint tasks and developing C4I CONOPS will occur at some point in the future.

## **G. CHAPTER SUMMARY AND CONCLUSIONS**

While long-term planning is highly valuable, it appears that both enterprises are currently unable to completely quantify and fully articulate weights and values between resources and capabilities. As explained in Chapter V, weights and values may become visible after several process iterations in the lexicographic minimum approach. Having weights and values produced by the enterprises may better facilitate the long-term more careful analysis prescribed by JCIDS. Whether further clarity for near and mid-term planning becomes available remains to be seen. If one of the tasks at hand is to measure a capability change when a change in status of a particular program occurs, it is not known for certain how many iterations of the process will be necessary to make this clearer within the rules of the existing allocation construct. This is especially true if this needs to be well-articulated in the near and mid-term.

### **1. Prioritized Joint Tasks Do Not Yet Exist**

In conclusion, it appears that the enterprises are able to manage their capability planning efforts, but are frustrated by a lack of clarity of information towards what to prioritize planning efforts to from above. Currently efforts are being made to define

JCAs and other information at the top level. This effort is not complete. Recently CJCSI promulgated the use of Joint Tasks as a prioritized list of essential war fighter functions to be used for near and mid-term planning, but as far as it can be seen these have not been developed or undertaken.

## **2. Prioritize the JCAs and Omit the Joint Tasks**

Preferably, although this is not articulated in any manuals, the JCAs should be prioritized for the short and mid-term. JCAs should be prioritized instead of joint-tasks due to the path-dependent nature of successful practices with increasing returns. (354) Namely, the enterprises are already aligning their efforts towards non-prioritized JCAs. Publishing joint tasks as priorities could create greater disruption to the already existing and implemented Capabilities Development Processes being utilized and developed. Prioritization of the JCAs would probably impose less work for the enterprises and higher levels because the development of Joint Tasks may be too much new work. With that said the CJCSI 3170.01F manual that will replace today's CJSCI 3170.01E manual should omit Joint Tasks and replace it with prioritized JCAs.

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## **VIII. CONCLUSIONS AND RECOMMENDATIONS**

### **A. CONCLUSIONS**

The Department of Defense focuses most of its strategic resource planning efforts beyond the time horizon of near-term and mid-term objectives. For this thesis, near- and mid-term objectives are considered to be within the realm of the FYDP, or a 0-7 year planning horizon. The recent Chairman Joint Chiefs of Staff Instructions have advanced the concept of prioritizing Joint Tasks as part of the top down capability planning methodology to be utilized in conjunction with CONOPS for near and mid term planning. Although CONOPS are used and observed now by the JCS, the Joint Tasks do not appear to have trickled down to the Naval Warfare Enterprise Pillars nor is there evidence of their existence in the Navy enterprise initiative, as described in Chapter VII. Furthermore, it has been expressed by managers performing the function of capability planning at the enterprise level, that greater levels of clarity to assist resources planning efforts inside the FYDP, in addition to long-term planning efforts, would have significant value. (355)

Recently, the Department of the Navy has adopted the enterprise construct to assist in its resource planning efforts. At the top-level of each of these enterprises a function similar to a private sector capability configuration described in Chapter IV, has been organized. The process utilized by the enterprises was initially known as the Naval Capability Development Process. This process was first implemented in 2003 in one enterprise and is now being implemented by the other enterprises. For example, the Naval Netwar ForceNet Enterprise (NNFE) has named their version of the NCDP as the FCP or ForceNet Capability Plan Process. Finally, the enterprise organization concept and cognizance over the implementation of the NCDP process has been restricted to the highest command levels in the Navy's five warfighting enterprises under the assumption that pushing this function to any location subordinate of this level would risk having this initiative fail, be fragmented or stove-piped. (356)

Private sector firms operate for profit in the marketplace. For the purposes of the DoD cost savings may be considered as a proxy for profit. However, private sector firms and DoD are vastly different organizations in mission and function. The purpose of establishing capability configurations in private sector firms is to generate and sustain

competitive advantage. (357) Private sector capability configurations are designed to establish prioritized core capabilities that reach a time horizon 3-4 years into the future. The primary desired outcome of this approach is to simplify resource allocation decisions, which in turn creates more efficient management decisions relative to the prioritized list of core capabilities. (358) These core- capabilities are then assumed to remain static for at least a 3-4 year time horizon. Meanwhile, the capability configuration is an ongoing planning effort managed by a team of top management personnel to monitor, shape, predict and organize all aspects of the firm around their consensual and prioritized core-capabilities.

From the resource manager's perspective, promulgating priorities for allocation within a short and mid-term time horizon simplifies the decision making process. This simplification provides many benefits. First, it enables a sound conceptual framework which enhances decision making. Second, if priorities and/or goals are more clearly defined then feedback and the measurement of accomplishment of those goals is easier. If the weights and values are not known, then a ranking of goals and repeated cycles measuring inputs and outputs is likely to be required to ascertain the true relationships between goals and desired results, as the federal and defense budget processes operate presently in annual cycles for example.

Subjective goal programming has taken place within large non-DoD organizations where the initial relationships between inputs and outputs are not known, (359) for example the University Goal Programming example described in Chapter II. However, it is likely that finding relationships between inputs and outputs was an iterative process of trial and error over a multiple number of trials where the goals remain static. Such a series of repeated iterations is one example of the requirements necessary for finding the true values of input variables and their specific relationships to the final output that enables a lexicographic minimum linear goal programming approach to solve a multiple objective problems. (360) This type of linear programming (LP) or mathematical decision making is described in Chapter V. While LP is a desirable approach to defining and making decision it is not feasible for DON and DoD for reasons explained previously in this thesis.

Although applying a goal programming approach to the Department of the Navy's capability planning efforts appears to be infeasible at this time, the intuitive logic for defining a methodology intended to find weights and values of relationships to allocate resources still applies. However, the part of the current Navy resource allocation process developed to identify capabilities appears far too complex to define and program because of the inability to accurately quantify actual relationships between raw materials and hard assets, and selection preferences, which are sometimes determined politically, into useful variables and equations. (361) However, similar to what is utilized in linear programming, one of the objectives of the NCDP is to define the weights and values between resources and capabilities. Therefore, it appears that execution of the NCDP may have certain similarities to developing a lexicographic minimum multiple objective solving approach. (362) The similarity between NCDP and lexicographic minimum multiple objective solving is that the true (or perhaps clearer) definitions of relationships should become more apparent after several iterations or years of execution of the capability planning process. In order to achieve this result accurate feedback is necessary. This feedback must be received by the managers of all programs and resources that contribute to a particular capability, who possess knowledge of what level of effort was provided towards the capability objective. The feedback that is provided should define the relationship between input effort provided and capability performance output. (363) Feedback is facilitated by clearly articulated objectives, which simplifies decision-making of limited resources. (364)

If more efficient and effective resource allocation is to be established using well-defined capabilities in the near and mid-term, (i.e., from the present to seven years in the future) is a significant enough priority to override other short and midterm objectives for the Department of Defense, then one means to achieve this goal is to prioritize capabilities within the FYDP. If this action is not undertaken then there is a greater potential for fragmented resource allocation decision-making as described in Chapter II. Whether this desire for greater efficiency and effectiveness becomes a significant enough issue to cause more careful selection of priorities, a maximum amount of information sharing remains essential (365) due to the relationship complexities of the Navy's capability resource allocation system given the nature of its reciprocal interdependent

coordination relationships, as described in the later part of Chapter VI. (366) As shown in Chapter II, budgeting towards capabilities appears to be a trend when budgets are reducing and where there is a requirement to sustain necessary levels of performance. Evidence of the problems that result from ineffective resource decision making may be seen in recent failures in downsizing the military where retention of required warfighting capabilities in the 1990s was not achieved, contributing to the need for ongoing supplemental budgets in the 2000s. (367)

Clearer definitions of goals that are measurable is of great value to improve DON and DoD management and resource decision making. The new system of enterprises mapping shows that enterprises are now more likely to prioritize their goals *within their enterprise*, but it is not certain whether goal setting above this level will be prioritized effectively or at all. Recent directives have promulgated this task at the joint level, as described in Chapter VII. However, due to the short period of time in which this endeavor has been implemented and the high level work-load involved to implement and construct the capability planning process at the enterprise level, it is too early to speculate whether or when the effort of defining joint tasks will be fully undertaken by the DON and DoD.

It may be the case that the enterprises will be able to better quantify the relationships between their programs, resources and capabilities within the current decision making construct. It also may be the case that prioritization of capabilities above the enterprise level might assist this process and speed it up. It may be that a lack of prioritization above the enterprise level will make these efforts either highly challenging or impossible to accomplish. From the financial manager's perspective of desiring to obtain the highest degree of efficiency within the resource allocation system, a conclusion is made here that prioritization of the capabilities for the near and mid term planning efforts will better objectify the relationships between the inputs and outputs of the system so as to produce more measurable results. This perspective could be balanced with other perspectives relating to near and midterm resource allocation planning in order to determine whether certain levels of financial efficiency through prioritization of objectives are more desirable than the possession of less financial efficiency with all objectives being highly significant and competing against one another.

Lastly, it may be the case that the capability resource allocation planning system will be path-dependent, as discussed in Chapter II, where in once a set of procedures becomes established as achieving positive results it is harder to change or unlock such learned practices even where there is a genuine desire to develop a more efficient system. Random events early on in the development of decision practices dictate the selection of methodologies. (368) Evidence of the Navy's capability allocation system and decision methodology as being path dependent is demonstrated in the successful development of the NCDP process in a single enterprise and follow-on application into other Navy enterprises. Since the capability allocation system is still in its early stages of development the question of how to develop the best pathway to defining and implementing improvements into the entire allocation process should be considered.

Of significant consideration in this regard is the methodology already established for aligning programming and budgeting efforts to capabilities in the NCDP process instead of planning towards Joint Tasks. As noted above, once a process becomes learned it becomes more difficult to unlearn or un-lock as time moves forward and people become used to using the process. Consequently, it may be easier for the Navy to prioritize the JCAs instead of creating the Joint Tasks, since a lock-in on the JCAs may have already occurred. (369) Finally, due to the only recent implementation of the capability allocation system, i.e., the NCDP process within the DON Enterprise construct, further study will be required to evaluate the desirability of the development, shortcomings and successes of this system.

## **B. RECOMMENDATIONS**

Based upon the findings in the previous thesis chapters and conclusions stated in this chapter, the following recommendations are offered to improve the Navy resource allocation effectiveness and efficiency:

1. Continue efforts to improve coordination and open lines of communication between all DON Stakeholders relevant to the budgeting and programming process with respect to development and integration of capability based budgeting. Although recent efforts have been made in DoD in 2001 and 2003 to improve coordination, (370) the current capability component within the planning process reflects reciprocal interdependence. Therefore, this process bears high and widely dispersed coordination

costs. (371) Due to the high coordination costs of this relationship and potential path-dependent nature of previous decision system problems that were supposed to be fixed by the reforms of the early 2000s, this method continues to evidence some serious deficiencies. (372)

2. Continue with the implementation of the Enterprise construct. Although it has only been in effect for a relatively short term, it is a successful organizational planning approach at the level it is undertaken. This conclusion is drawn to some extent based on the success of this system in the private sector. Since it is judged to be successful at this point in time, all effort with and above the level of the Navy across DoD to implement the Enterprise construct should be made to clearly define, support and, simplify work-effort for Enterprise capability planning personnel. The recommended on simplification is to establish clearer rules for the allocation process that support the individual autonomy of each of the enterprises while enabling a consensus that reflects the combined marginal benefits of all the enterprises combined so as to support the objectives of the DON. (373) The preferred method for doing this is stated in recommendation 3.

3. If budgeting, programming and capability planning needs to become more efficient for the short and mid-term, then prioritization of the JCAs within the FYDP is necessary. This should be done instead of creating, defining, and prioritizing the joint tasks, due to the nature of path-dependency and the already initiated working efforts across the enterprises and DON towards linking budgeting and programming of the non-prioritized JCAs. In answer of the question of who should prioritize the JCAs, the answer, based on the research performed for this thesis, is that DoD should accept this responsibility and perform this task. To answer the follow-up next question of what should happen if DoD does not do this, based on the findings of this thesis, the Navy should do it to benefit its own planning, programming and budgeting to provide this the best and highest quality information to the rest of the services and DoD. Finally, it needs to be stated clearly here that the long-term planning efforts of DoD do not need to be abandoned. Rather, the prioritization of the JCAs is the recommended way to improve near and mid-term planning efforts. Therefore, when CJCSI 3170.01F is published to replace CJCSI 3170.01E, then the prioritized JCAs should replace the prioritized Joint Tasks and all definitions of Joint Tasks should be omitted from the CJCSI.01F. Lastly,

this interpretation of the CJCSI.01F version should be published before the any of the work to define the Joint Tasks begins, due to the predictable effect of a lock-in effect and the potential that implementation of this approach will become-counter productive and even more burdensome over and above the work-load needed to correct the deficiencies in the existing JCAs process..

4. The words “*capability*,” “*capabilities*,” and “*capable*” do not appear frequently in the FY07 procurement narratives evaluated in this thesis as evidence (374) of budgeting and programming linkage to particular capabilities, as demonstrated in Chapter III. It is indeterminable whether future narratives will or should utilize these words to illustrate proof or evidence of linking budgeting, programming to capabilities. Choice of methodology for defining these relationships should be left to the discretion of DON. This thesis recommends that such an approach be undertaken and linked to the enterprise management framework presently under implementation in the DON.

5. Linear programming and mathematical decision models are not feasible to be utilized by the enterprises at this time. However, the pursuit of finding objective weights and values for defining variables and process relationships, similar to those used or described by linear programming, is probably worth the effort. Prioritizing the JCAs should enhance the process of better defining the relationships between resources and capabilities.

6. Future study is recommended to assess the progress, successes and failures of linking the POM and PPBES generally to capabilities within the DON. Furthermore, study of the relationships and interactions of the NCDP or FCP team members in prospective coordination with other stakeholders, and how planning documents are utilized should be worthwhile as a means for assessing how and where value is added in DON resource planning and decision making.

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